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Implementation of the Asthma Practice Guideline in the Army Medical Department

Evaluation of Process and Effects

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Preface

The RAND Corporation has worked with the Army Medical Department (AMEDD) on a project entitled "Implementing Clinical Practice Guidelines in the Army Medical System." This project was undertaken to assist the AMEDD in developing and testing methods to effectively implement clinical practice guidelines in Army treatment facilities, with the goal to achieve consistent and quality clinical practices across the Army health system. Three demonstrations were conducted to test and refine methods before embarking on full guideline implementation across the Army health system. These demonstrations tested use of guidelines for primary care management of low back pain, asthma, and diabetes.

This report presents the final findings from the evaluation that RAND conducted as part of the demonstration for the asthma practice guideline, which was conducted in 1999 and 2000. The assessment included a process evaluation of the experiences of the participating military treatment facilities (MTFs) as well as a quantitative analysis of clinical practices. The quantitative analysis was performed to document the extent to which intended actions were actually implemented by the MTFs, assess short-term effects on clinical practices, and develop and test metrics and measurement methods that can be adopted by the AMEDD for routine monitoring of progress.

We present the findings from the process evaluation and the quantitative analysis to provide as complete a picture as possible of baseline variations in practices across facilities, changes in clinical

practices made by the demonstration sites, and measurable effects of these actions. We also present diagnostic information on the quality and limitations of available data for monitoring practice improvements. Recommendations for future actions by the AMEDD are presented.

This report is one of three final reports being generated in this project. It should be of interest to anyone concerned with military medical systems and policies. Similar reports were prepared from the demonstrations for the low back pain and diabetes practice guidelines.

This research was sponsored by the U.S. Army Surgeon General. It was conducted jointly by RAND Arroyo Center, a federally funded research and development center sponsored by the U.S. Army, and by the RAND Center for Military Health Policy Research.

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Summary

The Army Medical Department (AMEDD) has made a commitment to establishing a structure and process to support its military treatment facilities (MTFs) in implementing evidence-based practice guidelines with the goal of achieving best practices that reduce variation and enhance quality of medical care. The Quality Management Directorate of the Army Medical Command (MEDCOM) contracted with RAND to work as a partner in the development and testing of guideline implementation methods for ultimate application to an Army-wide guideline program.

Three practice guideline demonstrations were fielded over a two-year period, in each of which participating Army MTFs implemented a different clinical practice guideline. All the demonstrations worked with practice guidelines that were established collaboratively by the Department of Veterans Affairs (VA) and Department of Defense (DoD).

This report presents results from our evaluation of the second of the three demonstrations, in which four participating MTFs implemented the asthma practice guideline in AMEDD's Southeast Region demonstration.[1] The evaluation included both a process evaluation to document the implementation activities of participating MTFs, and an analysis of effects to estimate the extent to which the sites' implementation activities affected specific measures of service delivery for

[1] The first demonstration was for a low back pain practice guideline, which was implemented at four MTFs in the Great Plains Region. The third was for a diabetes guideline, which was implemented by two MTFs in the Western Region.

asthma, with comparisons to a group of similar MTFs that did not implement the guideline. The evaluation also looked at the effects of the implementation on MTF costs.

Overview of the Military Health System

The Army operates a health system with more than 40 MTFs across the country and overseas that provide health care to military personnel, their family members, and retirees. This system has a regional structure led by the Army Surgeon General and MEDCOM. The MTFs range from small community hospitals to large regional medical centers offering tertiary services, which provide both ambulatory care and inpatient services.

Separate from the military health care system is its health insurance program, called TRICARE, that covers health benefits for eligible military personnel, family members, and retirees. To augment the MTF services, TRICARE contracts with local community providers in the civilian sector to provide covered services. This insurance program has a managed-care option called TRICARE Prime. All active-duty personnel are automatically enrolled in TRICARE Prime and are assigned to an MTF-based primary care manager (PCM), which serves as a gatekeeper for all care. Military family members and some retirees also have the option of enrolling in TRICARE Prime, in which case they can choose either an MTF-based physician or a community provider for their PCM. Those who are eligible for TRICARE but choose not to enroll in TRICARE Prime are automatically enrolled in another TRICARE option through which they can decide where to receive care on a case-by-case basis.

The Asthma Practice Guideline

The principal emphasis of the DoD/VA practice guideline for primary care management of asthma is on effective management of asthma, including medication management, with the goal of pre-

venting exacerbations that require treatment interventions. The guideline has four key elements: initial asthma diagnosis; asthma management procedures to classify asthma severity, treat based on severity, provide preventive maintenance, and educate patients on self-care; emergency management of asthma exacerbations; and telephone triage to assess severity of exacerbation and review the action plan with the patient.

Implementation of the Guideline

Four MTFs in the Southeast Regional Medical Command served as demonstration sites for implementation of the asthma guideline: Eisenhower Army Medical Center (AMC) at Fort Gordon, Georgia; Blanchfield Army Community Hospital (ACH) at Fort Campbell, Kentucky; Martin ACH at Fort Benning, Georgia; and Moncrief ACH at Fort Jackson, South Carolina. These four MTFs represented diverse patient populations, facility sizes, and service mixes. In preparing for implementation, MTF commanders designated a "guideline champion" at each facility to lead the implementation process, a facilitator to coordinate the MTF's implementation activities, and an implementation team with representatives from the various clinical groups involved in asthma care.

A systems approach was applied in the AMEDD practice guideline implementation demonstrations. This approach sought to ensure successful practice change in MTFs by addressing two main dimensions: building local ownership or "buy-in" from the staff responsible for implementing the new practices and ensuring that clinical and administrative systems are in place to facilitate staff adherence to the guideline.

The asthma guideline was introduced in September 1999. To prepare for implementation, MEDCOM held a kickoff conference to introduce the implementation teams from participating MTFs to the practice guideline and to provide monitoring metrics and a toolkit of materials to support the MTFs' implementation activities. At the conference, MTF teams developed action plans for implementing the

guideline. After the conference, each MTF team began to implement activities it defined in its plan. Although the MTFs varied in how quickly they started implementation, all of them were pursuing their planned actions by January 2000.

The RAND Evaluation

The evaluation of the asthma practice guideline demonstration consisted of both a process evaluation and an analysis of the effects of the guideline on service utilization.

Process Evaluation. We took a formative approach to the process evaluation in which we learned from the MTFs' experiences, provided feedback to the MTFs and MEDCOM, and facilitated shared learning among the MTFs. To gather evaluation information, we used a "climate survey" conducted during the kickoff conference; interviews, focus groups, and surveys, which were conducted during two evaluation site visits[2]; and monthly progress reports prepared by participating MTFs.

Effects Analysis. The analysis of the effects of the guideline on service utilization used a time-series, comparison-group design to estimate effects of the demonstration on six indicators of care that could be measured using available administrative data. These measures and associated hypotheses are shown in Table S.1.

We compared measures for baseline performance (one year before introduction of the asthma guideline, January through December 1999) and performance at one year following introduction (January through December 2000) for the four demonstration sites and six control sites. We estimated MTF costs of care for asthma patients and assessed how costs changed with guideline implementation.

Each MTF provides asthma care not only to patients enrolled with a PCM at its facility but also to patients enrolled in TRICARE

[2] The first site visits took place in February and March 2000. The second site visits took place in September 2000.

Table S.1
Asthma Indicators and Associated Hypotheses

Indicator	Hypothesis
Long-term controllers	Increase in percentage of asthma patients using long-term controllers (inhaled corticosteroid, leukotriene inhibitor, $Beta_2$ agonist/CS, or oral corticosteroid)
Complementary maintenance medications	Increase in percentage of asthma patients using complementary maintenance medications ($Beta_2$ agonist/LA or methylxanthine)
Short-acting rescue medications	Increase in percentage of asthma patients using short-acting rescue medications ($Beta_2$ agonist)
Outpatient visits	Decrease in asthma-related outpatient visit rate per 1,000 asthma patients
Emergency room visits	Decrease in asthma-related emergency room visit rate per 1,000 asthma patients
Hospitalization	Decrease in asthma-related hospitalization rate per 1,000 asthma patients

Prime with a PCM located elsewhere and others who have chosen the more open TRICARE coverage option. Recognizing this variety of patients, three patient groups were considered in the evaluation of guideline effects: the entire population of TRICARE-eligible asthma patients treated by Army MTFs or who resided in Army MTF catchment areas and were served by network providers, all asthma patients who used one of the demonstration or control MTFs for inpatient or outpatient services at least once during a year (*MTF users*), and asthma patients who are enrolled in TRICARE Prime and have a PCM at one of the demonstration or control MTFs (*MTF enrollees*), who are a subset of the MTF users.

The patient group used as the sample for assessing effects of asthma guideline implementation was the MTF enrollees at the demonstration and control MTFs. The distinction between the MTF enrollees and other patients served is important for this study. For patients with such chronic diseases as asthma, MTF-based PCMs have the span of control to manage care for the patients who are enrolled with them. However, MTFs have much less ability to manage care for patients they only see intermittently.

Baseline Performance on Key Performance Measures

We first characterized the total population of asthma patients (those who used an Army MTF or resided in an Army MTF catchment area in the continental United States) during the two-year study period.[3] An estimated 121,500 asthma patients were served during the first of our two study years and an estimated 121,000 patients were served during the second study year. This population consists primarily of Army family members, individuals affiliated with other military services, and family members of retirees. Patients are fairly evenly distributed across age groups. The asthma populations served by the individual MTFs vary widely in size, reflecting differences in the sizes and characteristics of the beneficiary populations residing in their catchment areas.

In examining data for demonstration and control MTFs, we distinguished between *MTF enrollees* and *MTF users*. Although the majority of asthma-related outpatient or emergency room visits were for MTF enrollees (patients who were enrolled in TRICARE at the MTF that provided their care), a substantial portion of patients seen were other MTF users (enrolled at other MTFs or civilian network sites). By contrast, the MTFs' own enrollees accounted for virtually all asthma-related inpatient care provided by these MTFs.

The baseline comparisons of outcome measures for the study sites show that many of the indicators varied only moderately across the MTFs at baseline. For the three medication indicators, in particular, MTFs had similar percentages of patients using each type of medication. For some service-use indicators, such as emergency room care and hospitalization, one or two MTFs had either much higher or much lower levels than the other MTFs in the sample. However, the importance of these differences depends on how the actual performance at each site varies from recommended guidelines, where applicable.

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[3] This population was defined using *International Classification of Diseases, Ninth Revision* (ICD-9), diagnosis codes in administrative data.

Lessons from the Process Evaluation

Performance on the Critical Success Factors

Research on practice guideline implementation has documented that a commitment to the implementation process, including use of multiple interventions, is required to achieve desired changes to clinical practices. Drawing on this literature as well as the experiences observed in the earlier AMEDD low back pain guideline demonstration, we identified six critical factors that influence how successful an MTF will be in integrating new practices into its clinical and administrative processes. We assess here the extent to which MTFs in this demonstration realized these success factors, which in turn affected their progress in implementing practice improvements.

- **Command leadership commitment at the MTF, regional, and system levels.** Management leaders at all three levels of AMEDD influence how front-line personnel perceive what priority the system places on the use of practice guidelines.

This demonstration had somewhat more positive support from the leadership of the participating MTFs than had been provided in the low back pain demonstration, but attitudes by regional and system-level leadership still were mixed. In the MTFs, the command team supported the implementation teams as they instituted the guideline, but this support generally was passive and MTF commanders did not exert full ownership locally.

- **Monitoring of progress.** Both the local MTFs and MEDCOM have roles in monitoring the quality of health care practices according to evidence-based standards defined in practice guidelines and roles in providing feedback needed for effective performance improvement.

The monitoring activities in the demonstration had a mixed track record. The focus of the demonstration MTFs was on using medical chart data to document the extent to which the new clinical

practices they had introduced were in fact being used—e.g., to document asthma severity in the chart. Such a focus helps to ensure that these practices are becoming an integral part of clinic processes as intended. Other than the analysis performed in this evaluation, MEDCOM did not monitor asthma metrics during the demonstration but relied on data generated by the MTFs.

- **Guidance and support to the MTFs by MEDCOM.** The structured approach and toolkits of supportive materials provided are resources that support the MTFs as they carry out actions to improve clinical practices.

By the time the asthma guideline demonstration began, MEDCOM had expanded its staffing and other resources, and we observed its staff providing regular policy guidance and technical support to help the MTF teams implement practice improvements for asthma care. During the site visits, the implementation teams at the demonstration MTFs reported this committed MEDCOM support was helpful to them and they were pleased to have it.

- **Guideline champions who are opinion leaders.** There is extensive evidence of the importance of having a designated clinical leader to serve as champion for the practice improvements being pursued.

The participating MTFs identified well-respected physicians to serve as guideline champions for the asthma demonstration, and these physicians showed a commitment to leading the implementation activities for their facilities. However, the champions could only make a time-limited commitment to the initiative, after which they tired of the concentrated effort or had to turn their attention to other priorities.

- **Resource support for champions.** To serve effectively as a guideline champion, the designated champion needs to be given adequate dedicated time and other resource support. This sup-

port also signals that the MTF command places a priority on guideline implementation.

The MTF commanders did not provide tangible resource support for the activities of the guideline champions, other than for attendance at the kickoff conference. As a result, the champions performed the implementation work in addition to their regular workload, which contributed to their reluctance to sustain the champion role. Facilitators designated by the MTF commander provided some staff support for the champions, a role that was part of the facilitators' regular responsibilities because they worked in the MTF quality management offices. The delayed implementation of the MTF action plans stemmed in part from competing demands on the champions' time.

- **Institutionalization of new practices.** For sustainability, the new practices being introduced need to be integrated into the standard practices of the facility as quickly as possible.

At the time of the last process evaluation site visit, the participating MTFs had made progress in introducing improved asthma management practices in some of their primary care clinics, but they had not yet achieved sustainable practices in those clinics. None had yet begun to extend the new practices into other clinics serving asthma patients that had not participated in the demonstration.

In summary, we observed reasonably good performance on some of the success factors in this demonstration. The most noticeable positive items were the MTF efforts to monitor their progress in implementing the intended practice changes and selection of effective champions. MEDCOM also was able to provide responsive support for the asthma demonstration. It appears that lessons learned from the earlier low back pain demonstration contributed to these management results (see Farley, Vernez, et al., 2003). Although the participating MTFs identified effective champions, the champions were not given dedicated time to help them perform their additional roles. Competing demands on champions' time weakened the teams'

actions to introduce and sustain improved clinical practices, as well as effects on clinical practice indicators.

Other Lessons from the Demonstration

Other lessons learned from the implementation include the following.

Strategies. The MTF were given the flexibility to design strategies that best met their needs. They used it to emphasize different components of the guideline and to undertake a variety of actions for change. Some risk is involved in this approach, however, that a team might pursue only expedient actions that are not resisted by clinical or administrative staff, which would slow progress toward the achievement of consistent practices across the AMEDD system.

Monitoring. Although the MTF teams took initiative to monitor asthma measures during the demonstration, several issues arose that require further attention. The data collected by the MTF teams were neither communicated to clinic staff to give them empirical knowledge of their performance on key aspects of care nor used to create accountability for performance. Measurement issues also were identified, including difficulty in retrieving administrative data the MTFs needed for monitoring, inconsistencies in chart abstraction processes, and inaccurate coding of asthma visits.

Standard Forms. The standard asthma encounter documentation form developed by MEDCOM received mixed reactions by providers because the form did not fully meet their needs. Because MEDCOM made the use of the form voluntary, many MTFs and primary care providers chose not to use the form, preferring to develop and use their own forms. Inconsistent use of the form makes it difficult to monitor performance because the needed data are incomplete.

Provider Training. The MTFs learned that multiple and ongoing training sessions would be required over time to train all primary care providers effectively on the asthma management processes specified in the guideline. The first training sessions reached only a fraction of the MTF providers, and continued training also was needed to refresh

their knowledge and to train newly arrived providers who rotated in from previous MTF assignments.

Patient Education. The provision of patient education on self-care was one of the weaker components of the implementation activities. Patient behaviors affect the MTFs' ability to achieve the intended asthma care practices and outcomes. How a patient handles the preventive aspects of asthma management will influence the frequency and severity of asthma exacerbations. Inadequacies in MTF patient education activities were identified, including problems with program design, limited receptivity of providers to referring patients for education, and limited patient attendance at the programs when referred.

Effects of the Demonstration on Service and Costs

Effects on Performance Measures

The RAND analysis found no significant changes in the six clinical practice indicators we identified for evaluating the effects of the asthma practice guideline demonstration. All three indicators for use of asthma medications declined from the first to second study year, which was the reverse of the hypothesized direction of change. Outpatient visit rates for the demonstration MTFs did not change from the first to second year, although we did observe seasonal variations in rates. For emergency room visit rates and hospitalization rates—which represent potentially avoidable health-care events that should decline as asthma management improved—we found no changes in rates during the demonstration.

There could be several explanations for these null findings. The most obvious is that the practice improvements the MTFs implemented were not sufficient to achieve changes in the measures. However, it also may be too early to detect some changes, such as reduced hospitalization rates. Alternatively, other practice changes might have occurred within the health-care encounters that were not captured adequately in these measures of encounter frequency. For example, opposing effects might be interacting in which better classification of

asthma severity moved more patients to mild intermittent levels, which would offset reclassifications to higher severity levels with unpredictable net effects on use of asthma medications.

Patterns and Trends in MTF Costs

The analysis of MTF costs revealed a decrease between the first and second study years in per-patient costs for the MTF enrollees at the demonstration MTFs, after adjusting for cost trends for the control MTFs (which control for temporal effects on use rates). Despite our inability to observe changes in the indicators we were tracking, it is possible that early practice changes made by the MTFs in introducing the practice guideline may have decreased the costs of care for enrolled patients served by the MTFs. If their actions did contribute, a likely source of effects would be changes in outpatient service mix or in the intensity of care during hospitalizations. However, other factors might also be contributing to the changes in service-use patterns that led to the observed cost reductions. Inpatient-use rates and costs should be tracked over time to identify trends and longer-term effects, as new care management methods become stronger.

Data Issues

Accurate assessment of MTFs' performance in implementing treatment guidelines requires the capability to routinely generate accurate and reliable data on the indicators monitored. Pertinent to this need, we identified three critical data issues that need to be addressed:

- **Inconsistent coding of diagnoses and procedures.** Effective monitoring of performance in treating asthma (or some other condition) requires consistent coding of diagnoses and procedures in the outpatient encounter records. MEDCOM has established standard codes for asthma, but at the time of the demonstration these codes had just been introduced and were not used consistently by the demonstration MTFs.

- **Unavailable data.** At the system level, the data needed to calculate many indicators (e.g., laboratory or radiology data) were incomplete, were obtained from separate data-extraction processes of varying quality, or were not currently available.
- **Absence of an asthma registry.** The Army health system lacks a centralized registry that can provide complete information on all asthma patients in the system and can be accessed by MTFs wherever they may be. In the absence of this data resource, asthma patients might not be identified or information on their past care and asthma status might be lost as personnel and their families move to new locations.

Recommendations

Ultimately, a practice guideline cannot be said to be implemented until lasting changes in practices are made. Yet all of the MTFs participating in this demonstration had difficulty integrating the new practices into the normal, ongoing MTF clinic operation. This finding highlights the need for focused attention by the leadership of MEDCOM and the MTFs to communicate clearly that achieving best practices is a system priority. It also highlights the need to continue to reinforce MTFs' implementation activities through technical support and effective monitoring to provide feedback to the MTFs on their progress.

We summarize here our recommendations for improving the implementation of the asthma guideline.

- **MEDCOM needs to establish consistent monitoring standards for performance metrics.** To achieve this consistency, standardized coding for patient status or procedures will need to be implemented effectively across the Army MTFs. MEDCOM will also need to consider whether it wants to establish a centralized system to collect the data directly from automated data systems or to have MTFs collect and analyze data locally and then report to MEDCOM.

- **MEDCOM should work with the MTFs to establish performance objectives on the asthma metrics.** To ensure that performance information is used to improve clinical practices, monitoring of the asthma metrics should be integrated in the MTFs' quality management or peer review programs and the MTF commanders should review processes and results regularly.
- **MEDCOM should develop software programs necessary to allow the MTFs to retrieve Composite Health-Care System (CHCS) and Ambulatory Data System (ADS) data.** MTFs currently have difficulty retrieving ADS and CHCS data for use in the monitoring process. To address this difficulty, the MTFs requested that MEDCOM provide them with the "ad hoc" software programs needed to extract the data.
- **As MEDCOM monitors the asthma metrics across MTFs, it needs to identify where improvements in quality and consistency of care are needed.** The MTFs were given considerable flexibility to develop implementation strategies. While this flexibility helps to ensure that each team can address the clinical practices most in need of improvement at its own MTF, it can also risk slowing progress toward the AMEDD goal of achieving consistent practices across facilities. By continuing to monitor the metrics closely over time, MEDCOM can determine whether to give greater direction to MTFs regarding which aspects of the guideline are to be emphasized and implemented uniformly.
- **MEDCOM needs to establish clear procedures and expectations for the use of forms.** Although sites were told that the use of the forms provided by MEDCOM was voluntary, participants at some of the MTFs still thought that use of the forms was mandatory. Other sites chose not to use the forms, but they did not apply alternative methods to ensure that asthma diagnosis and treatment were being documented appropriately. MEDCOM needs to forge a policy regarding the use of forms that supports efficiency and value for providers and patients, particularly for patients with multiple conditions for which more than one guideline may apply.

- **MEDCOM needs to further define the role of patient education in treatment processes of chronic conditions, while MTFs need to ensure that they are using the most effective patient education techniques.** The issue of patient education has increased in salience for AMEDD because many of the guidelines it has implemented are for chronic conditions that require self-care management by patients for effective overall management of the condition. MEDCOM needs to establish clear standards for patient education and ensure that MTFs have adequate resources and tested educational methods.
- **MTFs need to integrate training on clinical guidelines into their ongoing education for existing personnel as well as into the orientation sessions for both incoming primary care providers *and* ancillary staff.** Implementation teams often found that the training session on guideline implementation turned into a discussion of *whether* to implement the guideline rather than *how* to implement it. To train all primary care providers to desired levels of knowledge, multiple and ongoing training sessions would clearly be required over time, as providers deployed or rotated in and out of the MTFs.
- **MTFs need to integrate new practices into normal clinic operation—i.e., the way they "do business" for patient care.** A practice guideline cannot be said to be implemented until such lasting changes in practices are made. To help MTFs make lasting practice improvements, MEDCOM needs to communicate clearly that achieving best practices is a system priority, and it should continue to support and reinforce the MTFs' efforts by providing technical support and establishing an effective monitoring system to track and provide feedback to the MTFs on their progress.

Acknowledgments

An extraordinary amount of dedication and hard work by numerous individuals contributed to the performance of the AMEDD demonstration for implementing the DoD/VA asthma management guideline in the Southeast Region. In particular, we wish to acknowledge the efforts of the guideline champions, facilitators, and action team members at the Army treatment facilities participating in the demonstration. Through their implementation efforts, these teams achieved progress in changing clinical practices, and they offered invaluable feedback on how to make the implementation process stronger and more efficient.

We also acknowledge the commitment of the MEDCOM leadership team who guided this project and participated as an active partner in both the development and evaluation work on the asthma demonstration. LTC Kathryn Dolter, who had primary responsibility for the MEDCOM guideline implementation program, maintained a steadfast commitment to learning from the demonstrations and making this program come to life. The personnel in the Patient Administration Systems and Biostatistical Activity (PASBA) also made a major contribution to the evaluation by generating the administrative data for the analysis of the effects of guideline implementation. Their careful data extraction and programming efforts ensured the needed data integrity. Without the policy and financial support of the Center for Healthcare Education and Studies, headed by COL Harrison Hassell, this project would not have been possible.

Finally, we offer our thanks to our RAND colleagues, Susan Ridgely and Allen Fremont, for their thoughtful review of an earlier draft of this final report. Their suggestions for revisions helped to make this a stronger document. Any errors of fact or interpretation are, of course, the responsibility of the authors and not any of those who provided feedback on our efforts.

Abbreviations

ACH	Army community hospital
ADS	Ambulatory Data System
AMC	Army medical center
AMEDD	Army Medical Department
ANOVA	Analysis of variance
CEIS	Corporate Executive Information System
CHAMPUS	Civilian Health and Medical Program of the Uniformed Services
CHCS	Composite Health-Care System
CHPPM	Center for Health Promotion and Preventive Medicine
CME	Continuing medical education
DDS	DEERS dependent suffix
DEERS	Defense Enrollment Eligibility Reporting System
DMIS	Deployment Medication Information Sheet
DoD	Department of Defense
DRG	Diagnosis-Related Group
ER	Emergency room
FMP	Family member prefix
HCSR	Health-Care Service Record

ICD-9	*International Classification of Diseases, Ninth Revision*
ICU	Intensive care unit
MEDCOM	U.S. Army Medical Command
MEPRS	Medical Expense and Performance Reporting System
MTF	Military treatment facility
NHLBI	National Heart, Lung, and Blood Institute
NMOP	National Mail Order Pharmacy
OBD	Occupied bed days
PASBA	Patient Administration Systems and Biostatistical Activity
PCM	Primary care manager
PEC	Pharmacoeconomic Center
PLCA	Patient-Level Cost Allocation
QM	Quality management
SADR	Standard Ambulatory Data Record
SIDR	Standard Inpatient Data Record
SSN	Social Security number
SY	Study year
TMC	Troop medical clinic
UM	Utilization management
USPCC	U.S. per-capita costs
USPD	Uniformed Services Prescription Database
VA	(Department of) Veterans Affairs

CHAPTER ONE

Introduction

The Army Medical Department (AMEDD) has made a commitment to establishing a structure and process to support its military treatment facilities (MTFs) in implementing evidence-based practice guidelines to achieve best practices that reduce variation and enhance quality of medical care. With the goal of establishing such a system, the AMEDD contracted with RAND to work as a partner in the development and testing of guideline implementation methods for ultimate application to an Army-wide guideline program.

The AMEDD-RAND project fielded three sequential demonstrations over a two-year period, in each of which participating MTFs implemented a different clinical practice guideline. This approach was taken to enable AMEDD to test and refine new implementation methods on a small scale and then apply these methods to roll out practice guidelines across the Army health system.

Each of the three demonstrations used a practice guideline that was established collaboratively by the Department of Veterans Affairs (VA) and Department of Defense (DoD). In the first demonstration, a low back pain practice guideline was implemented in four MTFs in the Great Plains Region (Farley, Vernez, et al., 2003). In the second demonstration, which is the subject of this report, an asthma guideline was implemented by two MTFs in the Southeast Region. In the final demonstration, a diabetes guideline was implemented by two MTFs in the Western Region (Farley et al., 2005).

For each demonstration, RAND performed a process evaluation of the implementation process and an assessment of the effects of the

implementation on service use at participating MTFs. The evaluation also documented the measurement methods and related data requirements to provide a basis for future systemwide monitoring of progress in achieving best practices for each condition addressed by a guideline. This report documents lessons learned from the evaluation.

In the remainder of this chapter, we provide an overview of the military health system and we summarize the process that DoD and the VA used to establish practice guidelines and the approach used by the Army's Medical Command (MEDCOM) to implement the guidelines in the Army health system.

Overview of the Military Health System

The Army's health system includes more than 40 MTFs operating across the country and overseas. The MTFs provide medical care to active-duty military personnel from all services and their family members as well as military retirees. This system has a regional structure led by the Army Surgeon General and MEDCOM. The MTFs range from small community hospitals to large regional medical centers that offer tertiary services. Physicians provide care to their patients at clinics within the MTF. MTFs provide both ambulatory care and inpatient services, including diagnostic services for both clinics and inpatient units. Smaller facilities refer complex cases to the military medical center serving the region in which they are located.

The MTFs play an important role in the military's health insurance program, known as TRICARE, and its managed care option, known as TRICARE Prime. Coverage under TRICARE Prime is provided through the MTFs as well as through local civilian providers under contract. All active-duty personnel are automatically enrolled in TRICARE Prime and are assigned to an MTF-based primary care manager (PCM), who serves as a gatekeeper for all care. Military family members and some retirees also have the option of enrolling in TRICARE Prime and can choose either an MTF-based physician or a community provider for their PCM. Family members who do not choose to enroll in TRICARE Prime are by default considered to be

enrolled in TRICARE Standard/Extra, which allows beneficiaries to decide where to receive care on a case-by-case basis (Farley, Harris, et al., 2003).

The structure of TRICARE Prime has implications for the delivery of asthma care by MTFs, and it influenced the design of our evaluation of guideline effects. Each MTF serves both patients who are enrolled in TRICARE Prime with PCMs at its facility and patients who are enrolled in TRICARE Prime with a PCM elsewhere or who have chosen the more open TRICARE coverage option. For patients with such chronic diseases as asthma, MTF-based PCMs have the span of control to manage care for the patients who are enrolled with them. However, MTFs have much less ability to manage care for patients they see intermittently. Therefore, we focused our evaluation of guideline effects on TRICARE Prime patients enrolled with PCMs at the participating MTFs because we would expect that improvements in management of asthma care should have the greatest impact on this group.[1]

The DoD/VA Guideline Adaptation Process

The DoD and VA initiated a collaborative project in early 1998 to establish a single standard of care throughout the military and VA health systems. This project is led by a working group consisting of two representatives from each of the three military services and the VA. The goals of this project are adaptation of existing clinical practice guidelines for selected conditions, selection of two to four indicators for each guideline to benchmark and monitor implementation progress, and integration of DoD/VA prevention, pharmaceutical, and informatics efforts.

For each practice guideline, the DoD/VA Working Group designates an expert panel of representatives from the three military

[1] Other MTF patients, including TRICARE Prime patients who use a participating MTF but are not enrolled there and the total population of asthma patients in the military health system, are also discussed in the study to provide points of comparison.

services and the VA who represent a mix of clinical backgrounds relevant to the health condition of interest. The expert panel reviews existing national guidelines for that condition and examines and updates the scientific evidence supporting the national guidelines to establish a guideline for the military and veteran health systems. Each panel also recommends metrics to be used to monitor progress in guideline implementation.

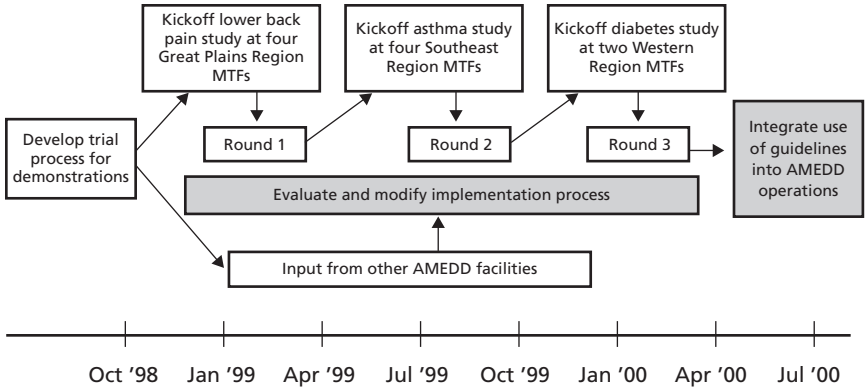
Each DoD/VA practice guideline is a statement of best practices for the management and treatment of the health condition it addresses, and it takes into account the strength of relevant scientific evidence, which is documented in the practice guideline report. The guidelines identify specific practices that are either strongly recommended or not recommended, while supporting clinical discretion on the part of providers.

The AMEDD-RAND Guideline Implementation Project

The three sequential demonstrations for low back pain, asthma, and diabetes guidelines have allowed AMEDD, RAND, and the participating MTFs to test and refine implementation methods. As shown in Figure 1.1, each demonstration was part of a "continuous quality improvement" cycle through which a regional test preceded system-wide implementation of a practice guideline. As the demonstrations progressed, RAND performed process evaluations to learn from the experiences of participating MTFs, and the cumulative results of past evaluations guided preparation for each subsequent demonstration. While the evaluations were under way, MEDCOM began preparations to implement the guideline in all MTFs across the Army health system.

The DoD/VA low back pain guideline was introduced in the Great Plains Regional Medical Command in November 1998, while the asthma practice guideline demonstration was introduced in the Southeast Regional Medical Command in August 1999 and the diabetes guideline was introduced in the Western Regional Medical

Figure 1.1
Diagram of the Demonstration Project



NOTE: Two MTFs participated in the diabetes demonstration, and data for an additional three MTFs that also implemented this guideline were used in the analysis of effects of implementing the guideline.

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Command in December 1999. Army-wide implementation began in spring 2000 for the low back pain guideline, in Fall 2000 for the asthma guideline, and in early 2001 for the diabetes guideline.

Overview of the Asthma Practice Guideline

Separate DoD/VA practice asthma guidelines were established for primary care management of pediatric and adult asthma. The principal emphasis of both practice guidelines is on effective management of asthma, including medication management, with the goal of preventing exacerbations that require treatment interventions. Four key elements of the guidelines are presented in Table 1.1.

As the MTFs implemented the asthma guidelines, any resulting changes in clinical practices were expected to reflect the guideline's emphasis on effective identification of probable asthma patients and management of the asthma to reduce the frequency of asthma exacerbations. To the extent that MTFs strengthened these practices

Table 1.1
Key Elements of the DoD/VA Asthma Practice Guidelines

Key Element	Description
Initial Asthma Diagnosis	
Establish asthma diagnosis.	Consider asthma in the differential diagnosis for patients presenting with respiratory problems, using spirometry and trials of medications to test for asthma as a diagnosis.
Asthma Management Procedures in Follow-Up Visits	
Classify asthma severity, treat based on severity, provide preventive maintenance, and educate patients on self-care.	Classify severity using National Heart, Lung, and Blood Institute (NHLBI) standards and objective measures (spirometry or peak flow) and patient report of symptoms. Treat based on severity with step-care approach; provide quick relievers and long-term controllers. Educate patients to self-monitor with peak flow meter, use medications, and recognize symptoms of worsening asthma. Use written action plans, preventive maintenance, and trigger avoidance. Follow up regularly.
Emergency Management of Asthma Exacerbations	
Perform initial objective assessment, treat promptly, and discharge patient with education.	When patient reports exacerbation, perform objective assessment using pulse oximetry, PEF, or FEV_1.[a] Treat promptly using corticosteroids or $Beta_2$-agonists. Assess response to therapy with objective measures. Discharge patient with education including written instructions and appropriate follow-up plan.
Telephone Triage	
Assess severity of exacerbation and review action plan with patient.	Assess the severity of the exacerbation and triage to appropriate provider or self-care instructions. Review with the patient the action plan developed and actions to be taken by the patient.

[a] Oximetry measures the oxygen content of the blood; FEV = forced expiratory volume; PEF = Peak expiratory flow.

through application of the practice guideline, there should be observable changes in use of primary care visits, spirometry (i.e., measuring pulmonary capacity), and asthma controller and rescue medications for asthma patients served by the MTFs, and there should be reductions in rates of use of emergency rooms and inpatient stays for exacerbations of asthma.

As part of the process of developing the asthma guideline, the DoD/VA working group responsible for developing the asthma practice guidelines established a set of performance indicators for asthma care. These indicators are the percentage of asthma follow-up visits with documented asthma severity level, the percentage of patients with persistent asthma who are prescribed inhaled steroids, the percentage of persistent asthmatics with a written action plan documented in the past 12 months, and the percentage of asthmatics six years or older with spirometry in the past 12 months.

As will be discussed in Chapter Two, we developed a set of hypotheses on effects of guideline implementation on various outcomes, which included effects for the DoD/VA indicators. These hypotheses are presented in Appendix A. However, because of data limitations and other constraints, we could use only one of the DoD/VA working group indicators—the percentage of patients with persistent asthma who are prescribed inhaled steroids.[2]

A Systems Approach to Implementation

Most studies that have evaluated the effects of guideline implementation on health-care practices have focused rather narrowly on individual interventions intended to change provider behavior (e.g., education, audit and feedback, reminders). Such studies allow researchers to design effective controls with relative ease. However, the results across these studies have been quite variable. This variation can be explained in part by differences in the guideline subject matters studied, provider attitudes, or organizational characteristics (Grilli and Lomas, 1994; Chodoff and Crowley, 1995; Lewis, 1995; Eastwood and Sheldon, 1996). Many of these studies have found weak compliance with guidelines—for example, one study found that

[2] Evaluation of measures related to spirometry or oximetry would require access to laboratory data from the Composite Health-Care System (CHCS), which were not available for this analysis. We also could not develop measures for asthma severity because it required extraction of data from medical charts, which was beyond the scope of this evaluation.

nearly one-third of the time primary care providers fail to follow even noncontroversial and evidence-based guideline recommendations (Grol et al., 1998). The studies indicate that active methods of guideline implementation, such as physician reminders and academic detailing (packaged information on desired practices), are more consistently effective than passive dissemination of guidelines or information on best practices. A combination of two or more implementation approaches has been shown to be more likely to succeed than a single intervention, with multifaceted interventions targeted at specific barriers being the most successful (Bero et al., 1998).

Influenced by systems thinking and quality improvement methodologies, health-care managers have come to favor multifaceted approaches to system change, as opposed to individual interventions, as the best hope for changing patient care practices (Senge, 1990; Shortell, Bennett, and Byck, 1998). For example, the Chronic Care Model suggests that improving care for the chronically ill requires major changes in multiple factors, including organization and delivery of care, information systems, doctor-patient relationships, patient self-management, and even the relationship between the health system and community resources (Wagner, Austin, and Von Korff, 1996; Von Korff et al., 1997). A premise of this and other integrated models is that testing the effects of single components of an intervention will yield misleading null results because dramatic changes in outcome occur *only* when all components of the model are in place.

Basic Implementation Strategy

The AMEDD has applied a systems approach in its practice guideline implementation strategy. Lessons from the low back pain demonstration highlighted that two main dimensions need to be addressed in an implementation strategy to ensure successful changes in practices by MTFs and other local facilities: build local ownership, or "buy-in," from the staff responsible for implementing the new practices and ensure that clinical and administrative systems are in place to facilitate staff adherence to the guideline.

Figure 1.2 illustrates how staff buy-in and system changes interact to produce different implementation results. Having *both* local

ownership and system support produces the optimal result, leading to likely implementation success. System support without local ownership produces providers resistant to implementation, despite clinic procedures and systems equipped to support the process. Provider ownership without system support produces providers who wish to change practices but are frustrated at their inability to overcome barriers in the MTF systems that hamper their ability to do so. Finally, with *neither* local ownership nor system support, implementation will fail.

Six Critical Success Factors for Implementation

Drawing on published literature on the implementation of guidelines in health-care practice, as well as the experiences observed in the prior AMEDD demonstration for the low back pain guideline, we identified six critical success factors that we believe strongly influence how successfully an MTF will be able to integrate new practices into its clinical and administrative processes. We used these factors as criteria for evaluating the overall success of the asthma guideline implementation. The results of that evaluation are presented in Chapter Six.

- **Command leadership commitment at the MTF, regional, and system levels.** Management leaders at the MEDCOM,

Figure 1.2
Matrix of Implementation Outcomes

	Local ownership	No local ownership
Systems *do* support recommended practices	✓	Provider resistance
Systems *do not* support recommended practices	Frustrated providers	X

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regional, and MTF levels of AMEDD influence how front-line personnel perceive what priority the system places on the use of practice guidelines. Such support has been shown to be necessary to empower teams to bring about effective practice changes (Solberg et al., 1997; Keller, 1997; Motwani, Klein, and Navitskas, 1999; Savitz and Kaluzny, 2000).

- **Monitoring of progress.** Both the local MTFs and MEDCOM have roles in monitoring the quality of health-care practices according to evidence-based standards defined in practice guidelines and providing feedback needed for effective performance improvement (Palmer and Hargraves, 1996; Sasala and Jasovsky, 1998; Cox, Wilcock, and Young, 1999; Lescoe-Long and Long, 1999; Savitz and Kaluzny, 2000).
- **Guidance and support to the MTFs by MEDCOM.** The structured approach and toolkits of supportive materials provided are resources that aid the MTFs as they carry out actions to improve clinical practices. Such support encourages MTFs to make needed practice changes to move toward consistency in practices across Army facilities (Sasala and Jasovsky, 1998; Motwani, Klein, and Navitskas, 1999).
- **Guideline champions who are opinion leaders.** Extensive evidence exists on the importance of having a designated clinical leader to serve as champion for the practice improvements being pursued (Palmer and Hargraves, 1996; Solberg et al., 1997; Gandhi et al., 2000).
- **Resource support for champions.** To serve effectively as a guideline champion, the designated champion needs to be given adequate dedicated time and other resource support. This support also signals that the MTF command places a high priority on guideline implementation (Palmer and Hargraves, 1996; Lescoe-Long and Long, 1999; Gandhi et al., 2000).
- **Institutionalization of new practices.** For sustainability, the new practices need to be integrated into the standard practices of the facility as quickly as possible to take advantage of early momentum and achieve early observable successes on which further action can be built. This requires successful design and exe-

cution of an action plan to change practices, including both educational and systems change interventions (Solberg et al., 1997; Motwani, Klein, and Navitskas, 1999).

The AMEDD Guideline Implementation Process

The asthma guideline demonstration was initiated when commanders at the demonstration sites, who serve in a role equivalent to that of a chief executive officer in the civilian sector, agreed to participate in the demonstration. To prepare for guideline implementation, the commander of each participating MTF appointed a multidisciplinary implementation team, a guideline champion, and a facilitator to help guide the MTF team's implementation activities. The team consisted of eight to ten individuals representing a mix of clinical and support staff involved in delivering care for asthma patients. The champion was to be a primary physician and an opinion leader at the MTF with a strong commitment to the successful implementation of the guideline. The facilitator was expected to have experience in arranging group decisionmaking processes as well as the ability to organize work processes and to work with data for quality management and monitoring activities.[3]

The systems approach applied in the demonstrations to implement the practice guidelines is shown in Figure 1.3. This process consisted of the following components:

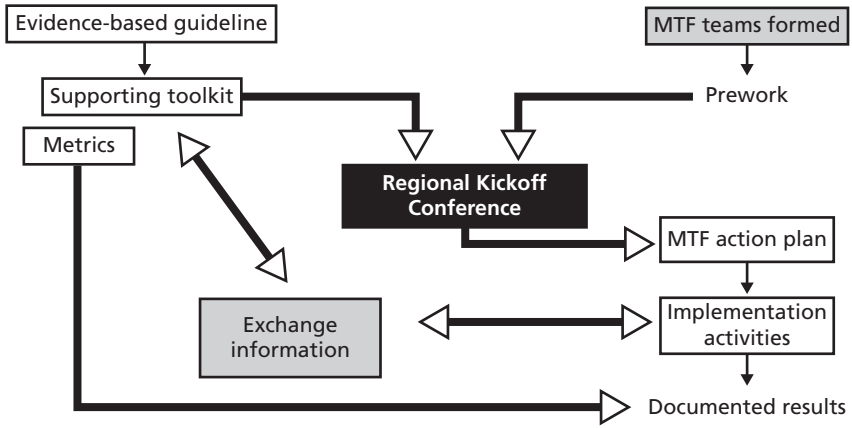
- **Practice guideline and metrics.** The official DoD/VA practice guideline materials are provided to the MTFs, including a summary list of the key elements of the guideline and metrics identified by the guideline expert panel for monitoring progress.
- **Guideline toolkit.** The MEDCOM and the Army Center for Health Promotion and Preventive Medicine (CHPPM) collaborate in the development of a toolkit of materials to support the

[3] The roles of the implementation team, guideline champion, and facilitator are discussed further in Chapter Four.

MTFs' guideline implementation activities (e.g., documentation forms, training videos, patient education materials, patient reminder cards).[4] Toolkits are provided to each of the demonstration MTFs along with refill support of consumable items.

- **Kickoff planning conference.** The multidisciplinary implementation teams participate in a two-day interactive meeting to develop guideline implementation strategies and action plans. Members of the teams interact with each other and with RAND and MEDCOM facilitators.
- **MTF implementation activities.** Following the kickoff conference, MTF implementation teams carry out their action plans. They prepare monthly reports that summarize recent activities, successes, challenges, and aid needed to support their work.
- **Information exchange.** Teams are encouraged to share experiences with each other and the RAND and MEDCOM facilitators to learn from errors and build on successes. Communica-

Figure 1.3
Guideline Implementation Process



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[4] CHPPM performs many of the Army's public health and preventive health activities for both wartime and domestic aspects of the Army's activities.

tion occurs through MEDCOM-supported listservs (mailing list program for communicating with other people who have subscribed to the same list) and direct e-mail communication.

- **Monitoring of progress.** Monitoring of implementation progress is performed by both MEDCOM and the implementation teams at the participating MTFs through site visits and data monitoring. Monitoring at the MEDCOM level focuses on metrics developed in the DoD/VA guideline process. MTFs are expected to use the DoD/VA metrics in their monitoring whenever data availability permits. They also are encouraged to track additional measures that provide information relevant to their specific practice improvement priorities and practices.

The Demonstration Sites

Four MTFs in the Southeast Regional Medical Command served as demonstration sites for implementation of the asthma guideline:

- Blanchfield Army Community Hospital (ACH) at Fort Campbell,
- Eisenhower Army Medical Center (AMC) at Fort Gordon,
- Martin ACH at Fort Benning, and
- Moncrief ACH at Fort Jackson.

The four MTFs participating in the demonstration represented diverse patient populations, facility sizes, and service mixes. Martin, Blanchfield, and Moncrief are ACHs that provide mainly primary care services with some specialty care. Dwight D. Eisenhower AMC provides primary, secondary, and tertiary care and trains AMEDD clinical personnel. The types of patients served and service activity of the MTFs are shown in Table 1.2.

The patient populations served by Blanchfield ACH are primarily active-duty personnel and dependents, whereas Moncrief ACH serves a relatively large retiree population, as does Martin ACH to

Table 1.2
Profiles of the MTFs Participating in the Asthma Guideline Demonstration

	Eisenhower AMC	Martin ACH	Blanchfield ACH	Moncrief ACH
DMIS Number	47	48	60	105
Number of beneficiaries				
Active-duty	10,432	15,463	24,382	9,318
Active-duty dependents	15,492	21,191	31,981	9,658
Retirees, dependents, and survivors	31,072	32,135	23,897	28,955
Other	764	869	389	3,532
Total	57,760	69,658	80,649	51,463
Percentage retirees	53.8	46.1	29.6	56.2
Service activity				
Inpatient dispositions*	1,932	2,587	3,281	1,357
Same-day surgeries*	2,952	888	2,412	503
Outpatient visits*	239,684	226,090	293,530	123,074

NOTE: All data are from the Corporate Executive Information System (CEIS). Asterisked items are for the period October 1998–March 1999. All other data are from FY 1998. DMIS = Deployment Medication Information Sheet.

a lesser extent. Eisenhower AMC also serves a large retiree population. These population differences are reflected in the MTFs' ratios of retirees to active-duty personnel, which range from a low of 0.98 at Blanchfield ACH to a high of 3.11 at Moncrief ACH.

The four MTFs also vary in other clinical and educational activities, as shown in Table 1.3. Martin ACH and Eisenhower AMC provide extensive medical education training. Martin ACH operates the Army's oldest Family Practice Residency Program and the clinical portion of the Physicians Assistants Program. Eisenhower AMC and Blanchfield ACH have asthma resource/education centers. Eisenhower AMC also has a health and wellness center that serves as a source for health education classes and screenings. All the MTFs except Moncrief ACH have allergy clinics. Martin ACH and Blanchfield ACH have numerous primary care/family practice clinics and troop medical clinics (TMCs). Sites vary widely in their access to and sophistication of computer support.

To preserve the confidentiality of participating MTFs, these facilities will be designated anonymously in this report as Demonstration Sites One through Four.

Table 1.3
Activities of the MTFs Participating in the Asthma Guideline Demonstration

Activity	Eisenhower AMC	Martin ACH	Blanchfield ACH	Moncrief ACH
Medical education	X	X		
Asthma resource center	X		X	
Wellness center	X			
Allergy clinics	X	X	X	
Primary care clinics	X	X	X	X
Troop medical clinics		X	X	

The RAND Evaluation

RAND's evaluation of the asthma demonstration consisted of two components: a process evaluation and an analysis of the effects of the guideline on a series of outcome measures. The first component was an evaluation of the implementation process at the four participating MTFs. The second component was an analysis of the effects of the guideline on service utilization at the four MTFs. Baseline service utilization (prior to guideline implementation) was also assessed to establish a benchmark for current practice. Service utilization was also assessed at six control sites to rule out the effects of temporal trends. Included in the analysis of service utilization was an assessment of the adequacy of Army medical databases for monitoring the results of the guideline implementation as well as future follow-up and provider feedback. The impact of the guideline on costs was also assessed. A full description of the methods used in the RAND evaluation can be found in Chapter Two.

Organization of This Report

In the remainder of the report, we present our evaluation methods and findings. Chapter Two describes the methods and data used for the evaluation. Chapter Three provides information on the size and characteristics of the asthma population served by Army MTFs and profiles baseline performance for the ten MTFs included in the

evaluation on each of the measures used to assess the effects of the guideline on clinical practices for asthma patients. Results of the process evaluation are reported in Chapter Four, and results of the evaluation of guideline effects are presented in Chapter Five. In Chapter Six, we synthesize the results of the full evaluation and identify lessons learned and implications for systemwide guideline implementation strategies and include our recommendations.

CHAPTER TWO

Methods and Data

The RAND evaluation for the asthma guideline demonstration gathered information about both the processes of implementing the practice guideline at participating MTFs and the effects of these implementation activities on delivery of care for asthma patients. In this chapter, we summarize the methods and data for these two evaluation components. Additional details about methodology are provided in Appendix B.

Implementation of a clinical practice guideline is one type of quality improvement intervention. An evaluation of any quality improvement intervention should recognize the incremental nature of these processes, which require time to achieve lasting improvements. A comprehensive evaluation of guideline implementation, therefore, would encompass the following three phases of emphasis:

- **Introducing new practices.** Evaluating initial practice implementation efforts emphasizes documentation of the extent to which effective action plans are developed and the intended actions are implemented. Process evaluation methods are used and sometimes feedback is provided to participants early in the process to help them strengthen their interventions.
- **Achieving intended changes in practices.** Evaluating process change involves monitoring short-term effects on service-delivery methods and activity through use of relevant quantifiable outcome measures.

- **Improving patient outcomes.** Assessing patient outcomes is a longer-term effort that also uses relevant quantifiable outcome measures. Patient outcomes were not assessed in this study.

In the second phase of the assessment (evaluating changes in practices), the data collected by RAND were also used to assess the availability and usability of DoD administrative data for monitoring effects of practice improvement processes on clinical practices. In this analysis, we assessed which indicators could be measured using centrally available (administrative) data and which indicators required data available only at the MTFs. We also examined coding and measurement issues that must be addressed to establish valid measures of the indicators using the administrative data. We document our findings on these issues in Chapter Five.

Process Evaluation Methods

To learn from the experience of the MTFs participating in the demonstration, the RAND team used a participant-observer approach, which provides for regular interactions between the evaluator and the teams being observed in a process evaluation. This approach allows for exchange of information and facilitates shared learning with the MTFs throughout the demonstration and evaluation process. The purposes of the implementation process evaluation were to accomplish the following:

- Document the actions and experiences of the demonstration MTFs with practice guideline implementation and assess performance relative to each of the six key success factors described in Chapter One.
- Identify areas where the policies, systems, and processes established by the AMEDD can be strengthened to better support systemwide guideline implementation.

To understand the full dynamics of the practice guideline implementation, we gathered information on the interactions of the many aspects of the system and from many stakeholders, including the implementation team, treatment program leadership, middle management, clinical and administrative staff, and patients.

Information was collected through a climate survey conducted during the kickoff conference, during site visits, and from monthly progress reports prepared by the team facilitators of the participating MTFs and submitted to RAND. Throughout the study, we maintained an ongoing communication process to provide a structure through which implementing MTFs could get assistance from each other, MEDCOM, or RAND.

We briefly describe each of these methods here. Additional details are presented in Appendix B.

Climate Survey

At the kickoff conference, members of the MTF command and implementation teams were asked to complete a written questionnaire designed to measure motivation and attitudes toward quality improvement and the practice guidelines specifically. The climate survey consisted of four modules that addressed motivation for guideline implementation, supportiveness of climate, attitudes toward practice guidelines, and efforts to improve quality of care. These modules are provided in Appendix C.

Each module contained sets of items with scaled ratings options, the responses to which were summarized to obtain overall scores for each climate component. For the module on motivation, respondents were asked to rate the importance of each of eight quality improvement factors. They also were asked to rate the current status of their MTF on each factor. The modules on climate for practice guideline implementation and attitudes toward guidelines contained seven and six items, respectively.

The climate survey results were used to assess the readiness of the participants and their organizations to embark on implementation of practice guidelines and other evidence-based practices. The survey results are reported in Chapter Four.

Evaluation Site Visits

Two evaluation site visits were conducted at each demonstration site as they were implementing the asthma practice guideline: one scheduled for the third month after the MTFs began implementing their action plans and a second approximately six months after the first visits.[1] Two of the sites started implementation by November and the other two sites had begun activities by early January 2000.[2] The demonstration and evaluation schedule was as follows:

- September 1999: Kickoff planning meeting for MTFs.
- February and March 2000: First evaluation site visits three months after the MTFs began implementing their plans (February for the two MTFs that started implementation in November and early March for the two MTFs that started in January).
- September 2000: Second evaluation site visits six months after the first evaluation site visits (all four MTFs).

In preparation for the site visits, RAND developed an agenda for the group meetings, individual interviews, and focus groups that we wanted to perform. The facilitator of each implementation team worked with that agenda to schedule the meetings with implementation team members and other individuals involved in the implementation process.

MEDCOM staff participated in the site visits with the RAND evaluation team, which allowed MEDCOM to learn directly from the MTFs' experiences. RAND conducted the interviews and focus groups and the MEDCOM staff provided technical assistance and other support to the MTF teams during the site visit. MEDCOM staff were also present as observers at interviews and focus groups to

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[1] We also conducted an introductory visit to each site a few months before the September 1999 kickoff meeting, during which we got acquainted with the MTF implementation teams and the facilities in which they work.

[2] Following the asthma guideline kickoff conference in August 1999, the delays MTFs experienced in starting implementation actions stemmed from time conflicts through the holidays as well as some startup inefficiencies.

learn firsthand from the MTFs' experiences and feedback. At the conclusion of each evaluation visit, we briefed the MTF command group about what we had learned and what issues we identified, which is a standard step for site visit processes at military facilities.

During the postimplementation site visits, we interviewed the guideline champion, team facilitator, and implementation team members to learn their respective perspectives on the process and their experiences. Semistructured interview methods were used for all interviews and group discussions, working from predefined lists of questions to cover during each session. All individuals were informed that participation in the interviews and focus groups was voluntary and that, to protect their privacy, everything we reported from the evaluation would be structured to shield the identity of individuals who were sources of comments or observations.

Separate focus groups were conducted with each of three types of stakeholder: the implementation team members, providers, and other clinic staff. The MTF champions and facilitators invited all individuals in each stakeholder group to participate in the focus groups. Attendance by those invited generally was high, so we had confidence that we obtained feedback representative of each group. To give focus group participants the privacy to express their opinions freely, the implementation team did not attend the focus groups for providers or other clinic staff. At the start of each focus group, we advised the participants of the informed consent provisions. We also described how this focus group fit into the overall site visit process, including the final briefing to the MTF command.

Using a written protocol, we asked participants in each focus group questions regarding how they felt about the guideline implementation, how they worked with the practice guideline, how they were affected by the implementation process, and what issues or concerns they had about the process.

Finally, we interviewed the command leadership of the MTF. These sessions allowed us to communicate to the leadership both progress being made by their implementation teams and issues regarding administrative or clinical barriers hampering guideline implementation. We also used these sessions to obtain feedback from

the MTF leadership on the practice guideline, the implementation process, and the level of priority they placed on this work.

At the second postimplementation site visits (at month ten of implementation), we began each interview or focus group by asking the participants to complete a written questionnaire that gathered information on individuals' views of the guideline and experiences in the implementation process. Separate questionnaires were used for each of three groups: providers, other clinic staff, and the implementation team members. The provider questionnaire can be found in Appendix D as an example.[3] Because the number of respondents was small for each group, we could not analyze or interpret the results statistically. However, the survey information helped identify issues and experiences useful to the process evaluation.

Monthly Reports

The final source of process evaluation information was monthly progress reports prepared by the team facilitators at the participating MTFs and submitted to RAND. These reports obtained information on the current status of implementation actions relative to the planned action schedule, successes achieved, challenges being faced by the teams, management methods for those challenges, and additional assistance that could be provided by MEDCOM. These reports documented the evolution of the MTFs' implementation strategy and progress. We used this information in our development of interview and focus group protocols for the second postimplementation site visits. The reports also stimulated follow-up action by both the MTFs and MEDCOM as the MTFs identified issues requiring resolution.

Outcome Evaluation

The outcome analysis had four goals:

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[3] Copies of the other questionnaires may be obtained from the authors.

- Document the changes in clinical process and service activity in the clinics that implement the asthma practice guideline.
- Document changes in asthma patients' service utilization attributable to the clinical process changes that have occurred.
- Assess average MTF costs of care for treatment of the asthma patients they serve and determine how those costs may have been affected by implementation of the guideline.
- Examine the usefulness of the metrics and measurement methods used in the demonstration and implications for how best to establish an effective system for routine monitoring of progress.

The importance of the fourth goal cannot be overstated. A viable monitoring process, including well-chosen, relevant measures, is essential for an MTF to retain the gains it achieved by modifying practices as recommended by the guideline. This feedback loop continues to provide MTF staff with program quality information, and it maintains the visibility of the measures being reported as priorities for high-quality performance.

Hypotheses for Effects of Implementation of the Asthma Guideline

Our evaluation of the effects of the asthma guideline at the demonstration sites was guided by several hypotheses that addressed possible practice changes and clinical measures for asthma patients. These hypotheses were informed by the official DoD/VA asthma metrics as well as by other aspects of care.[4] Reflecting the DoD/VA practice guideline and metrics, the hypotheses addressed the initial assessment of patients, asthma management and follow-up, and management of exacerbations.

We took the approach of identifying a broad scope of possible outcomes. This was done to inform priority-setting for future quality and performance monitoring activities and to stimulate improvements in data capabilities to measure important indicators of quality care. The hypotheses that generated our outcome measures are listed

[4] As noted in Chapter One, because of limitations of available DoD data, we could not use all of the DoD/VA indicators.

in Table 2.1. The outcome measures themselves are discussed later in this chapter.

Evaluation Design

To test these hypotheses, we used an interrupted time series control-group design. Trends for the outcome measures were estimated for one year before the demonstration sites began using the asthma guideline and for one year after its start date. This approach allowed us to estimate annual utilization measures, and it also controlled for any seasonality effects on asthma care. A control group of six additional MTFs was used to adjust for underlying historical trends that otherwise could threaten the validity of findings at the demonstration MTFs. The evaluation design is shown graphically in Figure 2.1.

Administrative data on utilization, medications, and laboratory tests were collected for asthma patients enrolled in TRICARE Prime at each of the four demonstration MTFs or six control MTFs included in the analysis. Data for each year in the study period were broken into four three-month quarters so we could track trends over time within the two-year study period.

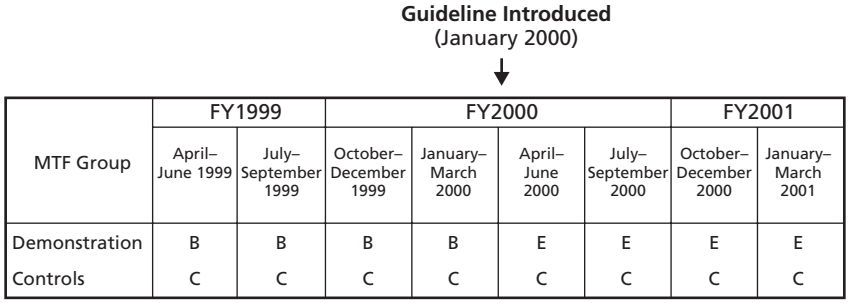
Choice of Demonstration and Control Sites

As described in Chapter One, four asthma demonstration sites were selected in the Southeast Region. MEDCOM and the Army Patient

Table 2.1
Expected Effects of Proactive Asthma Care Management

Increase in percentage of asthma patients using long-term controllers (inhaled corticosteroid, leukotriene inhibitor, $Beta_2$ agonist/CS, or oral corticosteroid)
Increase in percentage of asthma patients using complementary maintenance medications ($Beta_2$ agonist/LA or methylxanthine)
Increase in percentage of asthma patients using short-acting rescue medications ($Beta_2$ agonist)
Decrease in asthma-related outpatient visit rate per 1,000 asthma patients
Decrease in asthma-related emergency room visit rate per 1,000 asthma patients
Decrease in asthma-related hospitalization rate per 1,000 asthma patients

Figure 2.1
Evaluation Timeline



MTF Group	FY1999		FY2000				FY2001	
	April–June 1999	July–September 1999	October–December 1999	January–March 2000	April–June 2000	July–September 2000	October–December 2000	January–March 2001
Demonstration	B	B	B	B	E	E	E	E
Controls	C	C	C	C	C	C	C	C

NOTE: B = baseline period (study year one); E = experimental period (study year two); C = Control site conditions (no guideline introduction).
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Administration Systems and Biostatistical Activity (PASBA) also selected six control MTFs that matched reasonably well to the demonstration sites based on peer groupings already established for benchmarking within AMEDD and that did not undertake initiatives to improve care for asthma patients during the two-year study period. The peer groupings developed by PASBA were used to identify control MTFs that were similar to the demonstration MTFs in terms of size and service mix.

The Asthma Population

The analysis in this evaluation works with three distinct asthma populations:

- *Total asthma population*—All TRICARE-eligible patients with asthma who during the two study years defined for the evaluation either received asthma care or prescription for asthma medication at least once at any Army MTF in the continental United States or resided in an Army MTF catchment area and received asthma care from a network provider or filled an asthma medication prescription through the National Mail Order Pharmacy (NMOP).

- *MTF users*—Patients in the total asthma population who received inpatient or outpatient asthma care at least once during the study years from any of the MTFs that were demonstration or control sites.
- *MTF enrollees*—Patients in the total asthma population who during the study period were continuously enrolled in TRICARE Prime at one of the MTFs that were demonstration or control sites.

Defining the Total Population. We examine the total population to better understand the mix of asthma patients served by the Army MTFs and to characterize how these patients use MTFs or other community-based providers for their health-care services. The total asthma population was identified based on information available in the service utilization data for MTF care or network provider care and in records of prescription medications filled by either MTF pharmacies or the NMOP program. A patient was identified for the total asthma population if at least one record of any of the following types was found for the period between January 1999 and March 2001:

- MTF encounter record with an *International Classification of Diseases, Ninth Revision* (ICD-9), diagnosis code for asthma (code 493) in any of the diagnosis code positions and care provided in an Army facility (all Army facility IDs, including MTFs, clinics, and TMCs);
- Network provider claim with an ICD-9 diagnosis code for asthma (code 493) or in any of the diagnosis code positions and patient resided in the catchment area of an Army MTF or health center (parent facility IDs were used to pick up those residing in the parent facility catchment area even if they used a freestanding clinic with a separate ID);
- At least two prescriptions filled at an Army MTF pharmacy that was on a defined list of asthma medications (see Appendix B); or
- At least two prescriptions filled through the NMOP program on a defined list of asthma medications (see Appendix B) and the

patient Zip code of residence was within the catchment area of one of the Army MTFs or health centers.

We identified a total of 121,465 patients in the total asthma population during the first year of this study and 120,980 patients during the second study year. Additional details on the composition and demographics of these populations are provided in Chapter Three (Tables 3.1 and 3.2).

Defining MTF Users and Enrollees. These two subpopulations of asthma patients were identified for our analysis of the effects of the demonstration. The *MTF users* were identified as any patients who had at least one encounter (inpatient or outpatient) for asthma care services at one of the study MTFs at any time during the study year. The *MTF enrollees* were identified as those who were reported in all encounter or claims records for a study year as being enrolled TRICARE Prime at one of the demonstration or control sites.

The sample sizes at the demonstration and control MTFs for the analysis of the guideline effects are presented in Table 2.2. For study year one, a total of 8,439 asthma patients used one of the demonstration sites and 14,177 patients used one of the control sites at least once during the year (MTF users).

Our study sample for the effects analysis consisted only of the MTF enrollees. For the first year, the sample included 4,631 patients

Table 2.2
Asthma Patient Sample Sizes for the Demonstration and Control MTFs, by Study Year

	Study Year One		Study Year Two	
Enrollee Group	Demonstration Sites	Control Sites	Demonstration Sites	Control Sites
Study MTF users	8,439	14,177	9,057	13,742
Study MTF enrollees (study sample)	4,631	8,339	4,289	7,031
Other users	3,808	5,838	4,768	6,711

NOTE: *MTF user* refers to asthma patients who used an MTF for asthma care during the year; *MTF enrollee* refers to asthma patients enrolled in TRICARE Prime with a PCM based at an MTF.

enrolled at one of the four demonstration MTFs and 8,339 enrolled at one of the five control MTFs. For the second year, the sample included 4,289 patients enrolled at the demonstration sites and 7,031 enrolled at the control sites.

Data Sources

The analyses conducted in this study required data on outpatient visits, hospital inpatient stays, use of medications for asthma management, and laboratory tests. Table 2.3 shows the sources of the data.

All of these data except the Medical Expense and Performance Reporting System (MEPRS) data were extracted by PASBA, and the extracted data files were transmitted to RAND for analysis. Unit cost estimates based on the MEPRS data had been obtained by RAND directly from DoD as part of its evaluation of the Medicare-DoD Subvention Demonstration. Details of the methods for extracting data from these sources and for construction of the analysis files are presented in Appendix B.

Table 2.3
Source of Data for Analyses

Data Type	Source
MTF outpatient visits	Standard Ambulatory Data Record (SADR) data base extracted from MTF Ambulatory Data System (ADS) data
MTF inpatient stays	Standard Inpatient Data Record (SIDR) data base extracted from MTF Composite Health-Care System (CHCS) data
Outpatient visits and inpatient stays for network providers	Health-Care Service Records (HCSRs) maintained in the TRICARE Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) data system
MTF pharmacy data	Uniformed Services Prescription Database (USPD) maintained by the Pharmacoeconomic Center (PEC)
NMOP data	TRICARE NMOP data system
Financial data	Medical Expense and Performance Reporting System (MEPRS)[a]

[a] The DoD financial management data system that maintains facility-level financial data for all MTFs. This system uses a standard book of accounts to maintain records of operating costs, staff time and costs, and units of activities for each cost center.

Identification of the total asthma population using the MTFs included only records for which asthma had been included as a diagnosis code. Once we identified the MTF enrollees and MTF users, we also examined data for these individuals on all MTF services, network provider services, and pharmacy use for all patients in these groups.

Outcome Measures

The definitions of the numerators and denominators used to calculate the asthma practice guideline outcome measures are listed in Table 2.4. These measures operationalize the hypotheses presented in Table 2.1.

Definition of Key Variables

Variables for enrollment status, health-care service use, and medications were derived for calculation of the indicators being analyzed. We also defined variables for the military status, gender, and age of each patient in our study sample. Definitions of these variables with coding details are given in Appendix B.

Analytic Methods

The first step in the analysis was to calculate each indicator for episodes in each quarter-year of the study period. For each measure, we then estimated the baseline performance for the MTFs, described quarterly trends for the demonstration and control sites, and tested the statistical significance of any observed differences in performance of the demonstration site compared to the control sites. See Appendix B for details on the statistical tests.

Benchmarking. We combined data from the baseline study year of CY 1999 to create baseline measures on the six indicators for the ten MTFs included in the study as either demonstration or control sites. For each indicator, we compared the performance of each MTF to the mean performance of all other MTFs combined (i.e., excluding the index MTF). We did not adjust for multiple comparisons, which can increase the probability of Type 1 errors (false negatives), but we report significance levels at both the 0.05 and 0.01 thresholds. An

Table 2.4
Indicators Used to Measure Effects on Clinical Practices Related to Implementation of the DoD/VA Asthma Practice Guideline

	Calculation of the Indicator	
Indicator	**Numerator**	**Denominator**
Percentage of asthma patients prescribed long-term controllers	Number of asthma patients in the denominator who are prescribed long-term controllers[a]	Number of patients with asthma in the study year
Percentage of asthma patients prescribed complementary control medications	Number of asthma patients in the denominator who are prescribed complementary medications[a]	Number of patients with asthma in the study year
Percentage of asthma patients prescribed a short-acting rescue medication	Number of patients in the denominator who are prescribed a rescue medication[a]	Number of patients with asthma in the study year
Rate of asthma-related outpatient visits per 1,000 asthma patients	Number of asthma-related outpatient visits for patients in the denominator	Number of patients with asthma in the study year
Rate of asthma-related emergency room visits per 1,000 asthma patients	Number of asthma-related emergency room visits for patients in the denominator	Number of patients with asthma in the study year
Rate of asthma-related hospitalizations per 1,000 asthma patients	Number of asthma-related hospitalizations for patients in the denominator	Number of patients with asthma in the study year

[a] Long-term controller medications included inhaled corticosteroid, leukotriene inhibitor, $Beta_2$-agonist/CS, and oral corticosteroid. Complementary medications included anticholinergic, $Beta_2$-agonist/LA, and methylxanthine. Short-acting rescue medication was $Beta_2$-agonist.

ANOVA analysis (i.e., an analysis of variance between groups) confirmed significant variation among the ten MTFs for each of the measures. The baseline performance information for the MTFs is reported in Chapter Three, including figures with MTF comparisons for each of the six measures and testing of the statistical significance of differences among them in performance on each measure.

Descriptions of Trends for Indicators. To describe trend information, we prepared tables and figures displaying estimates for the indicators over the two study years, aggregated separately for the demonstration and control sites. Recognizing that the participating MTFs focused their efforts to implement the guideline in one or two

clinics, we also performed separate analyses that compared performance on the indicators for a "target group" of asthma patients served by those clinics with performance for asthma patients served by other clinics in the MTFs.

In cases where we found substantial differences in performance levels or trends among the demonstration or control sites, we examined trends separately for each demonstration site or examined aggregate trends for the relevant group of sites after excluding an MTF with outlying values. The quantitative results were compared to the implementation strategies of the demonstration sites to better interpret the observed trends. This step allowed us to assess the extent to which those strategies were reflected in observed service changes (or did not).

Testing the Significance of Indicator Trends. The final step of the analysis was to test whether observed changes in service rates or medication use, if any, were large enough to be statistically significant, after controlling for temporal trends and for patient characteristics. For each indicator, we estimated a regression model with the dependent variable being the indicator of interest and the predictor variables, including a dichotomous variable for demonstration or control, a set of dummy variables for the quarter-year periods, and variables for the patient characteristics.

To test for changes in the indicator for the demonstration sites between the baseline and intervention periods, we also included one or more interaction terms for demonstration sites and each of the three quarters of the intervention period. To determine the final specification of the interaction terms, we were guided by the observed trends for the measures and the significance of the coefficients on the interaction term for each quarter. The results of the trend analyses are reported in Chapter Five.

Estimating the Costs of Care

The analysis of costs of care had two purposes: to gain an understanding of the costs that MTFs incur for health-care services for

asthma patients and to evaluate whether introduction of the asthma practice guideline had observable effects on those costs for MTFs participating in the demonstration. The sample used for the analysis consisted of asthma patients served by the demonstration MTFs (the MTF user population). The analysis distinguished between costs associated with the MTF user and enrollee groups.

To estimate the costs of care, we used MEPRS financial data to develop sets of unit costs for different types of inpatient and outpatient encounters. The relevant estimated unit cost then was applied to each unit of service in the SIDR and SADR encounter records (where each record represented one unit of service).

In developing our unit-cost estimation methodology, we wanted to derive cost estimates that captured all MTF costs of care for inpatient or outpatient events and were sensitive to variations in the intensity of resources required to provide health care of different types. This cost estimation method was developed originally as part of the RAND evaluation of the Medicare-DoD Subvention Demonstration (Farley, Harris, et al., 2003).

We designed the cost estimation methodology with technical consultation from SRA International, the TRICARE Management Activity contractor that developed the Patient-Level Cost Allocation (PLCA) method used to design the financial provisions of the demonstration. The methodology we developed is an adaptation of the approach SRA took in developing the PLCA method.

For this cost analysis, we used cost and workload data for fiscal year (FY) 1998 that SRA generated for MTF outpatient clinics or inpatient wards for all Army MTFs included in this evaluation of the asthma guideline demonstration. Refer to Appendix B for details on the calculation of the unit costs and their application to each MTF inpatient and outpatient encounter record.

We note that some criticism has arisen within the DoD that the MEPRS data overestimates the MTFs' costs of doing business. The source of this criticism is a reported lack of documentation of vacation time as well as overestimation of the available hours of military personnel time for patient care activities. (Military personnel spend some of their normal work time on military-related activities, which

they should record separately from their patient care activities. However, many do record it as patient care time, thus inflating their reported time availability.) While acknowledging this issue, we also understand that MEPRS offers the best available data, and it is the basis for all other cost estimations for the demonstration.

We updated the unit costs to FY 1999 estimates by applying an inflation factor of 1.4 percent. These same unit costs were applied to encounters for both study years. By holding unit costs constant, any observed changes in costs between study years one and two can be attributed to changes in utilization. We tested two references for cost increases to determine the 1.4 percent inflation rate, which are described further in Appendix B.

Separate unit costs were applied to each MTF encounter for different types of hospital inpatient stays (e.g., medical, surgical) or outpatient visits to different types of clinics. Then we aggregated all encounters for each asthma patient in the study to the patient level, which we used to analyze per-capita costs. Costs also were analyzed at the encounter level to assess the distribution of MTF costs between TRICARE Prime enrollees and other beneficiaries, as well as to assess the extent to which costs are distributed between MTFs and network providers in the community. From the patient perspective, we examined the total, inpatient, and outpatient costs of care per patient for MTF services, looking separately at MTF enrollees and nonenrollees.

In the next chapter, we describe the patient population and provide baseline performance for the outcome measures for effective asthma care.

CHAPTER THREE

Asthma Populations and Practices at the Baseline

An understanding of the patient population and baseline performance for key care measures is critical for designing guideline implementation strategies by the demonstration MTFs and evaluating the impact of their implementation of those strategies.

Asthma patients need ongoing care management. Therefore, TRICARE beneficiaries with asthma are regular users of services covered by their TRICARE benefits. These services may be provided by MTFs or network providers, depending on the patients' TRICARE Prime enrollment status and the availability of needed services at the MTFs. As discussed earlier, each MTF serves asthma patients who are enrolled in TRICARE Prime at the MTF as its primary patient population as well as other patients who are not in Prime or who are enrolled at another location but need care while in the area or are referred there from another MTF or network provider.

In this chapter, we first report descriptive information on the services provided to the total population of asthma patients served by Army MTFs. This information was developed to better understand the mix of asthma patients served by the Army MTFs and to characterize how they use MTFs or other community-based providers for their health-care services.

We then describe the baseline performance of the asthma patients enrolled in TRICARE Prime at the MTFs that were demonstration sites or control sites (MTF enrollees). This baseline data shows how much variation exists in the asthma indicators across the study MTFs, which can help focus interventions to achieve greater

consistency in practices across the system. Baseline performance information provides a context for assessing strategies to improve performance as well as effects of using the practice guideline, which are examined in the next two chapters.

The Asthma Population Served by Army MTFs

Characteristics of the Total Asthma Population

An estimated 121,465 asthma patients resided in the service areas of Army MTFs and were served by either the Army MTFs or local network providers during study year one (CY 1999) and a slightly smaller number of 120,980 patients were served during study year two (CY 2000), as shown in Table 3.1. This table shows the percentages of asthma patients identified by using each of the encounter data sources, in the order by which counts for the data sources are displayed in the table. For study year one, for example, we were able to identify 52.7 percent of the patients using the SIDR and SADR data and we identified an additional 27.0 percent (for whom no SIDR or SADR data existed) by adding the PEC pharmacy data to the process. The network provider data added another 16.8 percent of patients, and the NMOP data added the remaining 3.5 percent. Similar percentages were found for study year two.

The data indicate whether asthma patients were active-duty Army personnel or other service personnel or military retirees or family members. Among those affiliated with the Army, the largest fraction (43,353 in study year one and 42,066 in study year two) was family members of active-duty personnel and the next largest group was family members of retirees (17,905 in study year one and 18,069 in study year two). Active-duty Army personnel were the smallest group (15,619 in study year one and 15,796 in study year two). More than 32,000 of the asthma patients were identifiable as personnel, retirees, or family members of personnel in services other than the Army. For the subset of patients only identified from the NMOP data, information on their military status was not available in the data obtained so they are reported separately in the table.

Table 3.1
Identification of the Asthma Population Served by Army MTFs or Network Providers in Army MTF Catchment Areas, by Study Year

	SIDR/SADR	PEC Pharmacy	Network Provider	NMOP	Total
Study year one					
Army active-duty	11,782	3,733	104	[a]	15,619
Army family member	30,632	8,534	4,187	[a]	43,353
Army retired	2,561	4,820	663	[a]	8,044
Retired family member	7,407	7,340	3,158	[a]	17,905
Other services	11,601	8,411	12,274	[a]	32,286
NMOP only	[a]	[a]	[a]	4,258	4,258
Total patients, year one	63,983	32,838	20,386	4,258	121,465
Percentage of total	52.7	27.0	16.8	3.5	100.0
Study year two					
Army active-duty	12,004	3,682	110	[a]	15,796
Army family member	30,380	7,620	4,066	[a]	42,066
Army retired	2,549	4,958	713	[a]	8,220
Retired family member	7,189	7,624	3,256	[a]	18,069
Other services	11,709	8,344	12,462	[a]	32,515
NMOP only	[a]	[a]	[a]	4,314	4,314
Total patients, year two	63,831	32,228	20,607	4,314	120,980
Percentage of total	52.8	26.6	17.0	3.6	100.0

[a] NMOP claims lacked data on the military status of beneficiaries, so we could not classify any patients who were identified only through NMOP claims.
NOTE: Study year one is January through December 1999 and study year two is January through December 2000.

The demographic characteristics of these asthma patients are reported in Table 3.2. Overall, 16.9 percent of the patients in study year one were less than 6 years of age, 23.1 percent were 6 to 17 years of age, 30.8 were 18 to 44 years of age, and 16.8 percent were 45 to 64 years of age. The elderly represented a fraction (12.3 percent) of total patients. The percentages were similar for study year two.

Enrollment Status and Use of MTF Services

The enrollment status of asthma patients seen at MTFs was also examined, for two reasons. First, MTFs should manage care more effectively for their enrollees than for intermittent users who may be obtaining care from local network providers or other MTFs. There-

Table 3.2
Demographic Characteristics of the Asthma Population Served by Army MTFs or Network Providers in Army MTF Catchment Areas, by Study Year

	All Patients	Army Active-Duty	Army Family Member	Army Retired	Retired Family Member	Other Services	NMOP Only
Study year one							
Distribution by age							
Total	121,457	15,619	43,347	8,044	17,905	32,284	4,258
Less than 6 years	20,531	4	14,567	0	604	5,343	13
6–17	28,096	48	15,956	1	3,910	8,001	180
18–44 years	37,465	14,695	11,391	883	2,939	7,305	252
45–64 years	20,390	850	1,159	3,550	6,291	7,077	1,463
65+ years	14,975	22	274	3,610	4,161	4,558	2,350
Distribution by gender							
Total	121,452	15,618	43,352	8,039	17,904	32,281	4,258
Male (%)	47.6	71.7	44.3	94.6	18.5	45.3	44.2
Study year two							
Distribution by age							
Total	119,980	15,796	42,066	7,220	18,069	32,515	4,314
Less than 6 years	18,679	3	13,267	0	524	4,879	6
6–17 years	28,272	55	16,075	0	3,766	8,209	167
18–44 years	37,437	14,822	11,239	878	2,934	7,306	258
45–64 years	20,768	891	1,203	3,592	6,400	7,300	1,382
65+ years	14,824	25	282	2,750	4,445	4,821	2,501
Distribution by gender							
Total	120,973	15,795	42,066	8,217	18,068	32,513	4,314
Male (%)	47.0	70.6	43.9	94.5	17.6	44.7	42.4

NOTE: Study year one is January through December 1999 and study year two is January through December 2000. The finding of active-duty and retired personnel under 18 may represent errors in the records.

fore, MTFs should be held accountable first for care to their own enrollees, and any performance-monitoring system should use measures calculated specifically for this population. Second, for accurate calculation of performance measures, all care obtained by each asthma patient group should be taken into account. For example, as MTF-based PCMs manage asthma care for their enrollees, they may refer them to specialty care by physicians at other MTFs or by other providers. Further, a patient may have an exacerbation while away from home and use an out-of-town emergency room for care. These events all need to be included in the measures for use rates for those services.

Our analysis revealed the importance of using both MTF service encounter data and network provider claims to gain a full understanding of service-use patterns. As shown for study year one in Table 3.3, 80.2 percent of MTF outpatient or emergency room visits were provided for members of the asthma patient population enrolled in TRICARE Prime at the MTFs (the numbers for study year two are similar). Another 19.1 percent of the visits were for nonenrolled patients, and less than 1 percent of services were for patients enrolled with network providers. Thus, a substantial share of MTF health-care resources were dedicated to providing outpatient services for nonen-

Table 3.3
Enrollment Status for Patients Receiving Asthma Care at Army MTFs or Network Providers in Army MTF Catchment Areas, by Study Year

	Asthma Outpatient/ ER Visits		Asthma Admissions	
	Number of Encounters	Percentage of Total	Number of Encounters	Percentage of Total
Study year one				
MTF service				
MTF enrollee	103,308	80.2	4,971	98.9
Network enrollee	908	0.7	51	1.0
Not enrolled	24,666	19.1	2	0.0
All patients	128,882	100.0	5,024	100.0
Network provider service				
MTF enrollee	24,004	37.1	326	12.6
Network enrollee	24,745	38.3	1,186	45.9
Not enrolled	15,892	24.6	1,072	41.5
All patients	64,641	100.0	2,584	100.0
Study year two				
MTF service				
MTF enrollee	110,661	83.8	4,242	98.5
Network enrollee	831	0.6	60	1.4
Not enrolled	20,530	15.6	3	0.1
All patients	132,022	100.0	4,305	100.0
Network provider service				
MTF enrollee	23,334	34.3	273	11.9
Network enrollee	31,310	46.1	1,039	45.2
Not enrolled	13,299	19.6	985	42.9
All patients	67,943	100.0	2,297	100.0

NOTE: *MTF enrollee* refers to individuals enrolled in TRICARE Prime with a primary care manager based at an MTF. *Network enrollee* refers to individuals enrolled in TRICARE Prime with a PCM who is a network provider.

rollees. By contrast, an MTF's own enrollees accounted for virtually all inpatient care provided by MTFs.

The patterns differed for network provider services. An estimated 38.3 percent of network provider outpatient and emergency room visits were provided to patients enrolled in TRICARE Prime with network providers. Another 37.1 percent were provided for patients enrolled at MTFs, and 24.6 percent were provided to nonenrollees. A different distribution was found for network provider inpatient services, with 45.9 percent provided to network provider enrollees, 12.6 percent provided to MTF enrollees, and another 41.5 percent provided to nonenrollees. These results are displayed graphi-

Figure 3.1
Enrollment Status of Asthma Patients for Outpatient and Emergency Room Visits to MTF and Network Providers, by Study Year

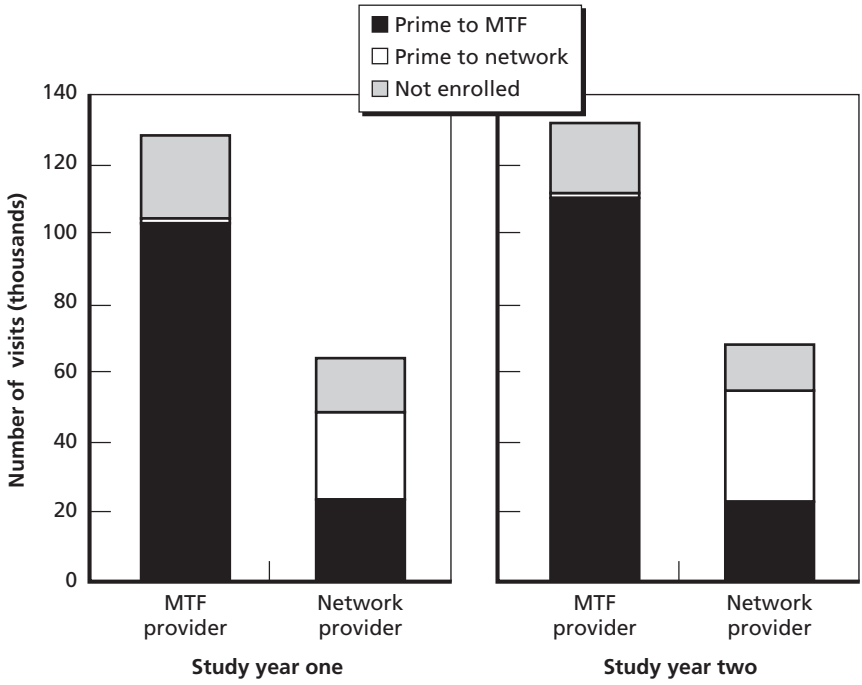

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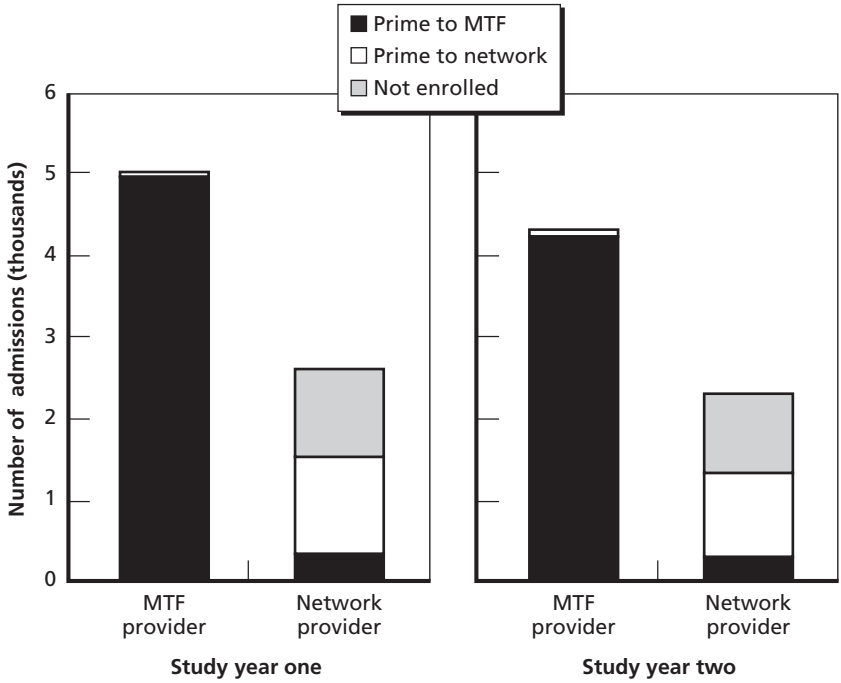
Figure 3.2
Enrollment Status of Asthma Patients for Inpatient Admissions at MTFs and Network Providers, by Study Year



RAND *MG319-3.2*

cally for outpatient and emergency room visits in Figure 3.1 and for inpatient stays in Figure 3.2.

Figures 3.3 and 3.4 provide a view, respectively, into outpatient and emergency room and inpatient admission use patterns from the patient's perspective. The two figures show the distribution of encounters by provider type for each type of enrollment status. The data illustrate that patients enrolled at MTFs use a mix of MTF and network provider services, confirming that all of these services must be considered to obtain accurate estimates of their health-care use rates.

Baseline Performance on Asthma Care Measures at the Study MTFs

The number of asthma patients who used each of the demonstration and control sites is reported in Table 3.4. These data include separate counts of all patients who used each MTF at least once during each study year (MTF users) and the subset of patients who were enrolled at the MTF all year (MTF enrollees), as indicated by enrollment status codes on their encounter records. The overall percentages of MTF users who were MTF enrollees were similar for the demonstration and control sites. For example, during study year one, 4,631 out of the 8,439 MTF users for the demonstration MTFs (54.9 percent)

Figure 3.3
Outpatient and Emergency Room Visits to MTFs and Network Providers, by Enrollment Status of Asthma Patients and Study Year

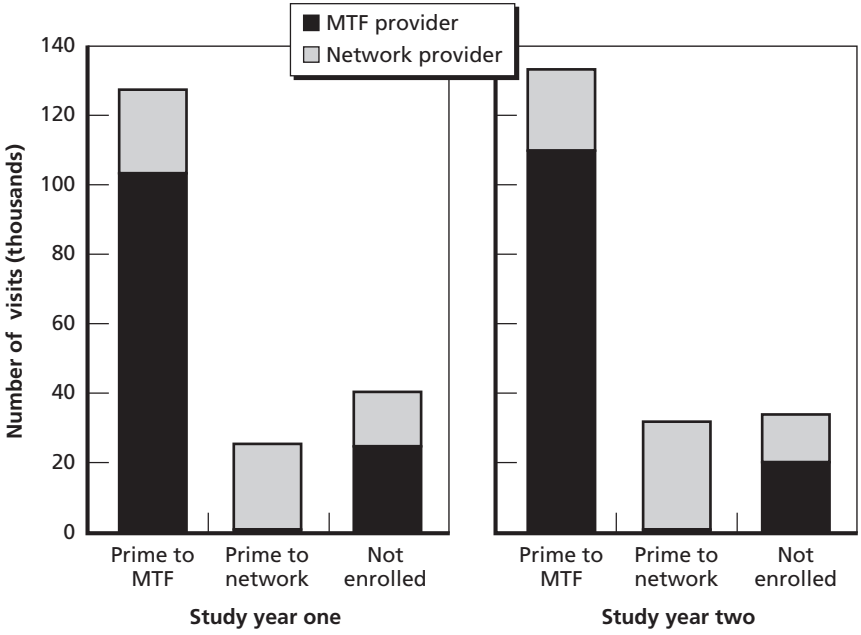


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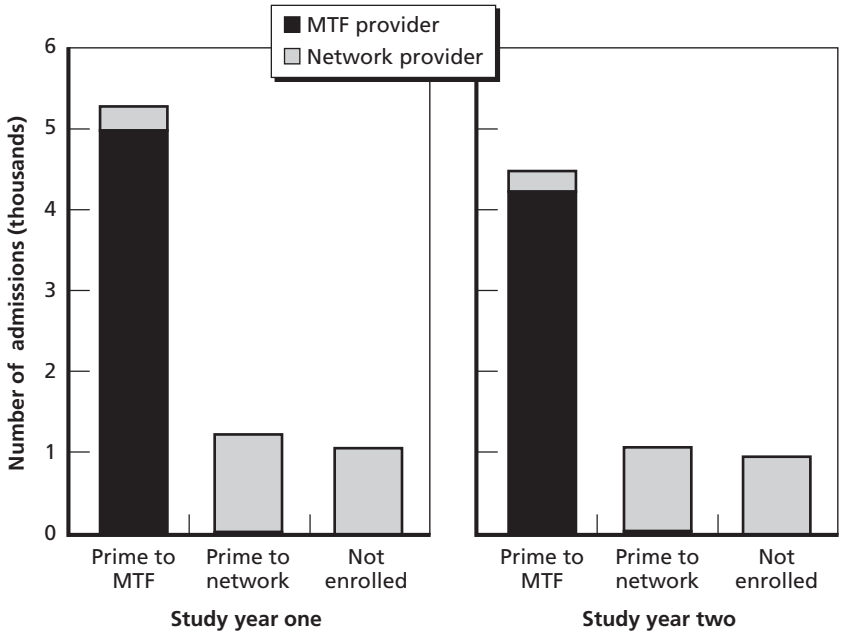
Figure 3.4
Inpatient Admissions at MTFs and Network Providers, by Enrollment Status of Asthma Patients and Study Year



RAND *MG319-3.4*

were enrolled in TRICARE Prime at the sites. By comparison, 8,339 out of the 14,640 MTF users at the control MTFs (57.0 percent) were enrolled there. The total size of the patient sample for the control MTFs was larger than the sample for the demonstration MTFs because there were six control MTFs and only four demonstration MTFs. However, the average numbers of patients per MTF for the two groups were similar for both MTF users and enrollees.

Using the MTF enrollee group of patients (those enrolled in TRICARE Prime at a study MTF), which was the study sample for the effects analysis, we calculated average values of the six guideline effect indicators for the baseline time period of January through December 1999 (study year one). We calculated separate values for each of the 10 MTFs in the study as well as an overall average for

Table 3.4
Asthma Population Using the Demonstration and Control MTFs, by Study Year

	Study Year One		Study Year Two	
Study Site	MTF Users	MTF Enrollees	MTF Users	MTF Enrollees
Demonstration sites				
Demo 1	2,295	1,176	2,375	1,059
Demo 2	2,590	1,159	2,469	1,043
Demo 3	2,406	1,715	2,689	1,628
Demo 4	1,148	581	1,524	559
All demos	8,439	4,631	9,057	4,289
Patients per site	2,110	1,158	2,264	1,072
Control sites				
Control 1	2,380	1,635	2,097	1,280
Control 2	1,729	785	1,740	659
Control 3	1,401	736	1,394	595
Control 4	4,631	2,621	3,927	2,050
Control 5	2,853	1,747	2,676	1,558
Control 6	1,646	815	2,489	889
All controls	14,640	8,339	14,323	7,031
Patients per site	2,440	1,390	2,387	1,172

NOTE: *MTF enrollee* signifies beneficiaries who were enrolled in TRICARE Prime at this MTF for all of their inpatient and outpatient encounters in the SIDR and SADR data.

each indicator, which was a benchmark against which the value for each MTF could be compared.

Table 3.5 lists the six outcome measures and describes the rationale provided for each by the asthma guideline. Wide variation across MTFs on any given measure suggests that MTFs may not be providing care consistently, which could include overtreatment in some cases and undertreatment in others.

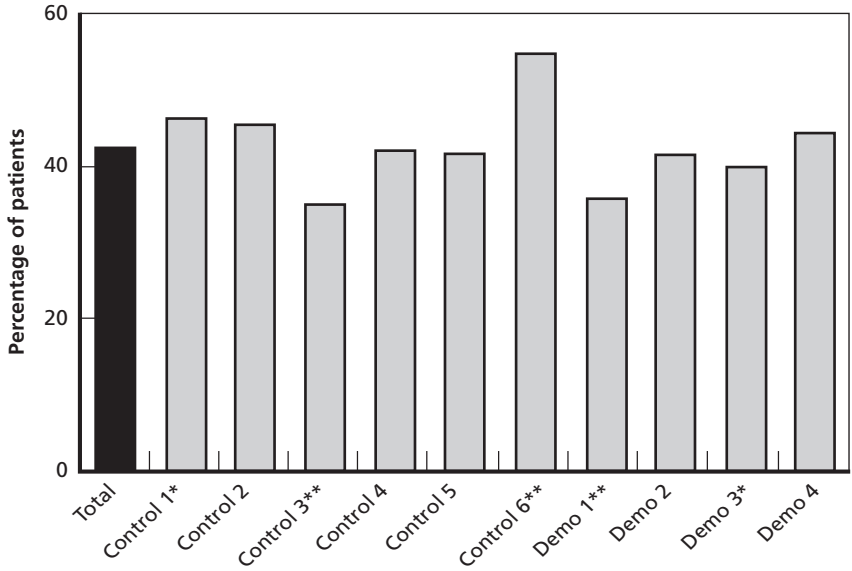
Figures 3.5 through 3.10 show baseline performance of the study MTFs on the six indicators of asthma care. The first bar on the left of each figure indicates the overall average baseline performance for all ten MTFs, and the remaining bars show the values for individual MTFs. To protect the confidentiality of the MTFs, the results are reported anonymously.

We tested the statistical significance of the differences of MTF values by comparing each MTF's average value for a measure to the

Table 3.5
Rationale for Asthma Indicators Provided by the Guideline

Indicator	Guideline Direction
Long-term controllers	For asthma more severe than mild intermittent, long-term controller medications are to be used according to severity level. Very low percentages of patients on controllers may signal inadequate preventive care.
Complementary medications	Complementary medications support long-term control of asthma for some patients.
Short-acting rescue	Patients should have prescriptions for rescue medications for response to exacerbations.
Outpatient visits	Asthma is to be managed proactively according to severity level. Very low visit rates may signal inadequate care management.
Emergency room visits	Proactive management of asthma should reduce emergency visit rates for exacerbations. High visit rates indicate a need for more prevention.

Figure 3.5
Baseline Percentage of Asthma Patients Prescribed Long-Term Controller Medications, Total and by Site



*p = less than 0.05, **p = less than 0.0.

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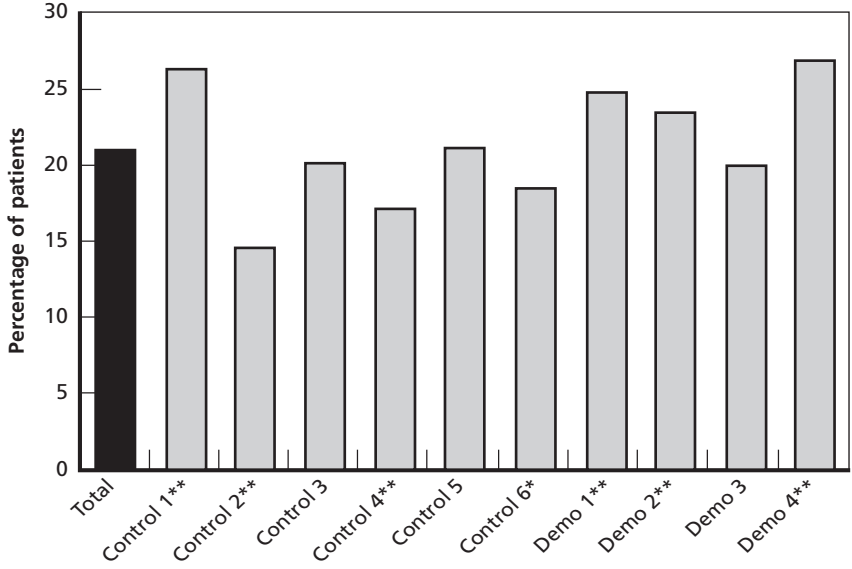
Figure 3.6
Baseline Percentage of Asthma Patients Prescribed Complementary Medications, Total and by Site



*p = less than 0.05, **p = less than 0.01.

RAND *MG319-3.6*

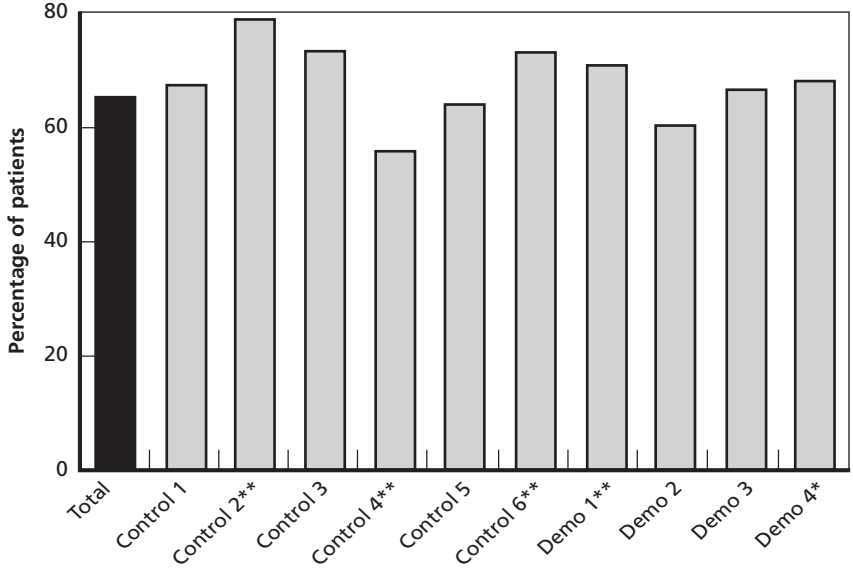
average value for the remaining nine MTFs. When the performance of an MTF differs significantly from the average of the other MTFs, the MTF's label in the legend is followed by asterisks (* for $p < 0.05$, ** for $p < 0.01$). As discussed in Chapter Two, both the clinical significance of observed differences among MTFs and the statistical significance of these differences should be considered when interpreting these results.

Long-Term Controllers. We find moderate variation across the study MTFs in the baseline percentages of asthma patients who were treated with other long-term controller medications to reduce the frequency of asthma exacerbations. As shown in Figure 3.5, the percentages of patients on these medications averaged 43 percent and ranged between 35 and 55 percent across the study sites. Not all of the differences observed were statistically significant.

Complementary Medications. The percentages of asthma patients prescribed complementary medications were lower than the percentages with long-term controllers, and these percentages varied more widely across the study sites, as shown in Figure 3.6. For all sites, an overall average of 21 percent of patients had been prescribed complementary medications, ranging from 14 percent to 27 percent across the individual sites. The size of these differences were statistically significant for seven of the ten MTFs.

Short-Acting Rescue Medications. Asthma patients were more likely to have prescriptions for short-acting rescue medications than the longer-term controller medications. Across all MTFs, Figure 3.7 shows that an overall average of 65 percent of patients had been pre-

Figure 3.7
Baseline Percentage of Asthma Patients Prescribed Short-Acting Rescue Medications, Total and by Site



*p = less than 0.05, **p = less than 0.01.

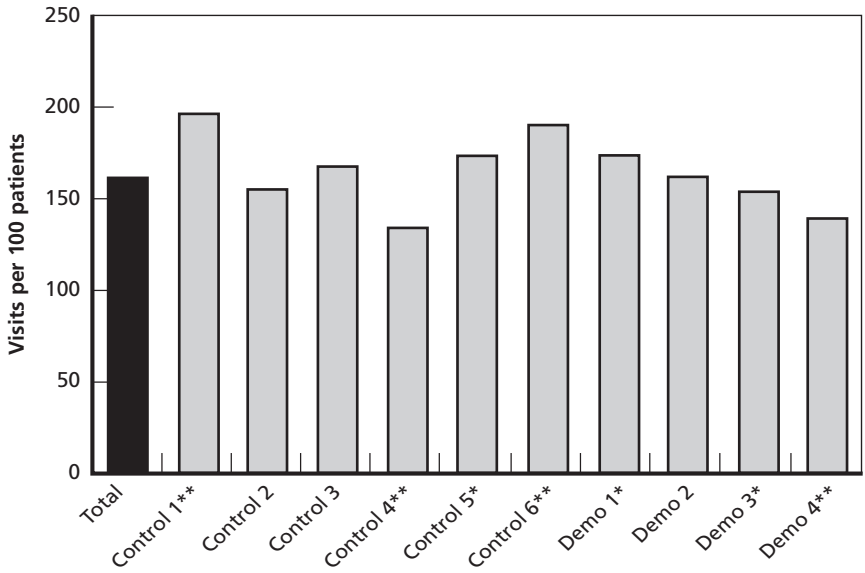
RAND *MG319-3.7*

scribed a rescue medication, with values at individual MTFs ranging from 55 percent to 79 percent of patients. This range represents moderate variation across facilities, similar to that for the long-term controllers. This also is reflected in the smaller number of MTFs for which the size of differences were statistically significant.

Outpatient Visits. For asthma-related outpatient visits, an overall average of 165 visits per 100 patients occurred, as shown in Figure 3.8. Rates for the individual MTFs ranged from 135 visits to 200 visits per 100 patients, and about half of the differences among MTFs are statistically significant.

Emergency Room Visits and Hospital Inpatient Stays. We find variation across MTFs for both measures, which is statistically significant for many of the MTFs, as shown for emergency room visits in

Figure 3.8
Baseline Annual Asthma-Related Outpatient Visits per 100 Asthma Patients, Total and by Site



*p = less than 0.05, **p = less than 0.01.

RAND *MG319-3.8*

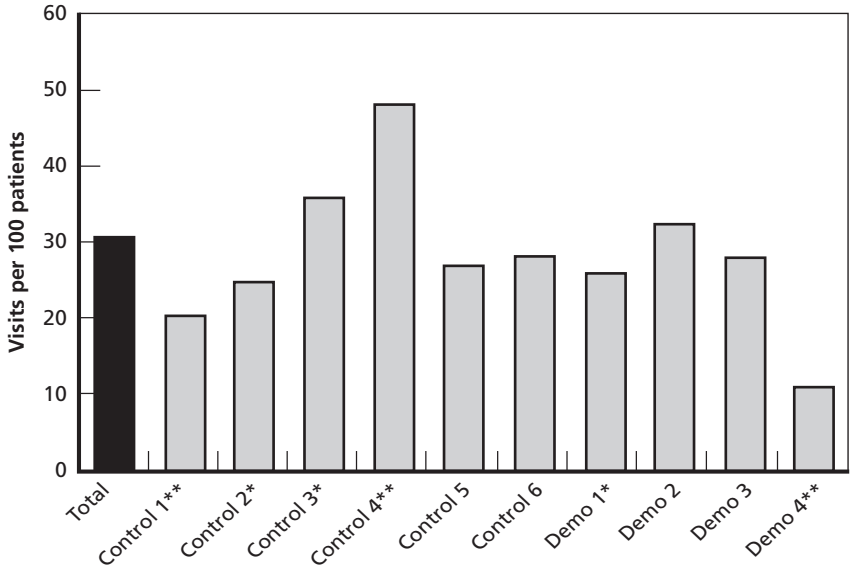
Figure 3.9 and for hospital inpatient stays in Figure 3.10. Facilities with rates on these measures significantly higher than those of other MTFs are candidates for assessment to analyze the contributing factors to the high rates and identify actions that might be taken to improve prevention of asthma exacerbations and related incidence of emergency room use or hospitalizations.

Summary

The baseline data analysis produced the following findings.

- The asthma population served by Army MTFs is large and consists primarily of Army family members, individuals affiliated

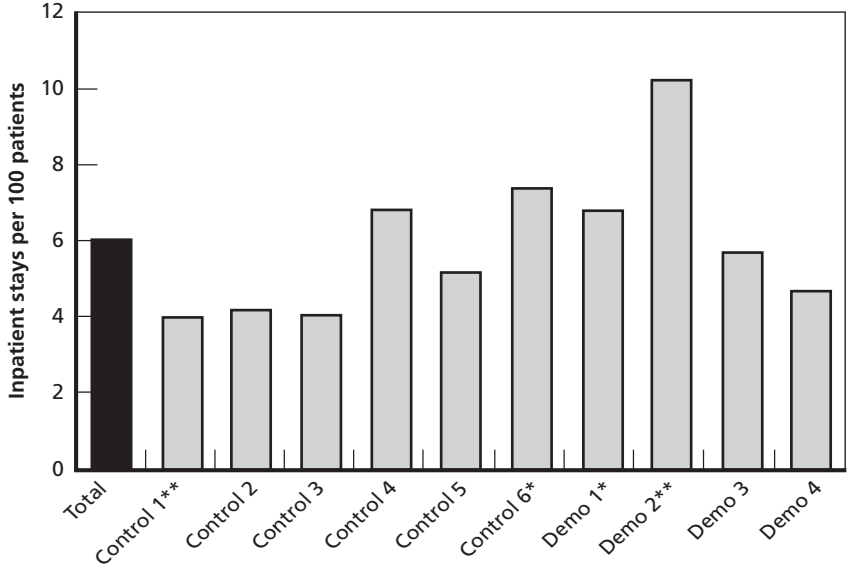
Figure 3.9
Baseline Annual Asthma-Related Emergency Room Visits per 100 Asthma Patients, Total and by Site



*p = less than 0.05, **p = less than 0.01.

RAND *MG319-3.9*

Figure 3.10
Baseline Annual Asthma-Related Hospitalizations per 100 Asthma Patients, Total and by Site



*p = less than 0.05, **p = less than 0.01.

RAND *MG319-3.10*

with other military services, and family members of retirees. Patients are fairly evenly distributed across age groups. The asthma populations served by the individual MTFs vary widely in size, depending on the sizes and characteristics of the beneficiary populations residing in their catchment areas.

- Although the majority of asthma patient outpatient or emergency room visits involved TRICARE Prime beneficiaries who were enrolled at the MTF that provided care, a substantial portion of patients seen were enrolled at other facilities (MTFs or civilian network sites). By contrast, each MTF's own enrollees accounted for virtually all inpatient care provided that MTF.
- The baseline comparisons of outcome measures for the study sites show that outcome measures vary only moderately across the MTFs for many of the indicators at baseline. For the three

medication indicators, in particular, MTFs had similar percentages of patients using each type of medication.

- For some service-use indicators, such as emergency room care and hospitalization, one or two MTFs had either much higher or much lower levels than the other MTFs in the sample. However, the importance of these differences depends on how the actual performance at each site varies from recommended guidelines, where applicable.
- The baseline measures can be used as benchmarks to detect differences across facilities and to identify areas where practice improvements may be needed.

CHAPTER FOUR

The Guideline Implementation Process

The asthma guideline demonstration was the second of the three demonstrations that tested an implementation approach that coordinated actions at the command (MEDCOM) and local (MTF) levels to achieve best clinical practices. MEDCOM defined the desired clinical practices (as specified in the DoD/VA practice guideline) and key metrics to measure attainment of those practices; provided tools to assist the MTFs as they introduced new practices in response to the guideline; and facilitated MTF guideline implementation via site visits, e-mail, and phone communications.

The practice changes were carried out by the MTFs as the health-care delivery organizations. The MTFs were offered the flexibility to define strategies and clinical process changes within the context of their respective missions, populations, and administrative and clinical assets. Because these characteristics differed across facilities, we expected to observe differences among the MTFs' implementation strategies and the pace at which they introduced practice changes.

This chapter reports the findings of the process evaluation in terms of the infrastructure established for the asthma guideline demonstration and the strategies and actions undertaken by the MTFs to implement best practices for management of asthma patients. We first describe the MEDCOM support structure and activities. Next, we describe the MTF environment and support structure for guideline implementation at the participating MTFs, including support by the MTF command team and roles of the guideline champions, facilitators, and implementation teams. Then we describe the strate-

gies and actions of the MTF implementation teams, as identified in their action plans, and we assess the progress they made in achieving desired practice changes. A summary of key findings in the process evaluation is included at the end of the chapter.

MEDCOM Support

The system-level responsibility for operating the AMEDD program for evidence-based practice guidelines was assigned to the MEDCOM Quality Management Directorate. Initially, the staff for this new initiative consisted of a full-time program director and a secretary. By the time the asthma guideline demonstration began, the MEDCOM program staff had been expanded, with the addition of three full-time guideline representatives to support MTFs in implementing the three demonstrations as well as other practice guidelines that were being introduced for implementation across the AMEDD system.

The asthma practice guideline demonstration had the advantage of building on the lessons learned from the low back pain guideline demonstrations, which were shared with the participating MTFs during the kickoff conference (described below) and throughout the MTFs' implementation activities during the demonstration.

MEDCOM supported the MTFs in implementing the asthma practice guideline by organizing an offsite kickoff conference to introduce the implementation teams to the guideline and help them develop implementation action plans, providing the MTFs with a toolkit of items to support guideline implementation, and encouraging communications and technical support among the demonstration sites and MEDCOM. We briefly describe each of these activities and provide our findings regarding each of them.

The Kickoff Conference

The MTF implementation teams gathered for two days on August 19–20, 1999, in Augusta, Georgia. This planning conference was run by MEDCOM with RAND administrative support. A total of 46 individuals from the four demonstration MTFs participated in the

conference, and five individuals from other MTFs attended as observers.

The meeting began with a half-day of plenary sessions at which the asthma guideline was introduced and instructions for action plan development were provided. The teams used the majority of the meeting to develop their respective implementation action plans. Each MTF team had designated a facilitator who guided the team through a four-step planning process developed by RAND. All plans included activities to introduce the guideline and implementation tools to both providers and ancillary staff, plans to increase patient education and case management, and changes needed in clinic procedures to bring asthma care into compliance with the guideline. The MTFs also identified the metrics they planned to monitor on a regular basis. The MTF teams briefed the representative of Southeast Regional Command on their action plans at the end of the conference.

Participants were asked to complete an evaluation form at the conference to provide feedback on the usefulness of the conference and to make suggestions for improvements. We obtained an approximately 80 percent response rate from the participating MTF team members. In general, participants reported that the planning activities at the kickoff conference were useful to them. They also rated very highly the information they received at the conference. Features of the conference that participants liked best included the guideline itself, the conference notebook, the breakout sessions, the examples of implementation plans provided, and the toolkit. Participants suggested that future kickoff conferences could be improved by providing the clinical practice guideline and notebook before the conference and by allowing more time for the breakout sessions. Some participants suggested that the conference be lengthened by up to one full day to allow more time for planning activities.

The Asthma Toolkit

In preparation for the asthma guideline demonstration, MEDCOM and the Army Center for Health Promotion and Preventive Medicine convened a toolkit workshop in January 1999 with the participation

of about 40 providers from Army MTFs who would use the materials in the toolkits. At the workshop, the providers identified and developed tools to assist Army MTFs in working with the asthma practice guideline. Using the products generated by the workshop participants, MEDCOM and CHPPM then prepared the core set of implementation tools.

Table 4.1 provides a list of the items included in the toolkit. These tools were similar to those provided to participants in the low back pain demonstration, although the asthma tools had been revised based on feedback received in the earlier demonstration.

Feedback on the Forms. Feedback from MTF staff on the toolkit items was obtained during group interviews and focus groups conducted during our first site visits. We received fewer comments on the asthma tools than we had on similar tools used in the low back pain demonstration, which may reflect improvements to the tool development process that had been made in response to feedback from the low back pain demonstration. However, it also appeared that the MTF staff were overwhelmed by the large number of items in the asthma toolkit. For example, few of the providers interviewed had even seen all of the tools. This lack of exposure to the tools undoubtedly contributed to the low use of these items made by the sites, as described below.

Encounter Documentation Form 701-R. This documentation form included a section on vital signs to be filled out by the clinic staff, a self-assessment and current medication section to be completed by the patient, and a section to be completed by the health-

Table 4.1
Contents of the Asthma Toolkit

Provider Support	Patient Self-Management Support
Encounter documentation form 701-R	Pamphlets on asthma self-management
Master problem form 702-R	Videos and CD on asthma education
Patient action plan 703-R	Three videos on asthma treatment
Patient education form 704-R	CD on asthma treatment
Sample peak flow meter	
Reminder cards on guideline elements	

care provider. Primary care providers participating in the focus groups reported that they generally liked the form, although at our first visit they suggested that more blank space be added for clinical notes. They also suggested that the patient portion of the form be expanded to add the following items: coughing as a symptom, allergies, hospitalization history, and date of last visit to ER.

Despite generally positive responses to the Form 701-R design, use of the form was actively encouraged by only one MTF implementation team, and this site was the only one to actually use the form consistently. One other site preferred to continue using another form that it had developed prior to the demonstration.

At the other two sites, use of Form 701-R was left to the discretion of each physician. At both sites, physicians also preferred to continue using Form 600 (the standard cover form generated for each visit and attached to the patient's medical chart). They expressed preference for Form 600 because it provided more space and flexibility to write text notes. They also thought Form 701-R was poorly suited for patients with multiple diagnoses, who constituted a significant share of their patients. At one of these sites, ancillary staff reported that use of Form 701-R increased the time required to process patients for visits.

Master Problem Form 702-R. This form was developed to record the patient's history of tests, emergency room visits, inpatient admissions, triggers, severity, and therapeutic interventions. Most physicians reported they never had seen this form, and none of the clinics in the four MTFs used it.

Action Plan Form 703-R. This form was designed as a handy way to comply with the asthma guideline by providing a written treatment plan and set of steps for the patient to follow in the event the status of their asthma was in the "green," "yellow," or "red" zone. The form was to be signed by the patient. At our first site visit, physicians suggested that the form be produced with a carbon copy so the patient would have a copy and another copy would be placed in the medical chart. Physicians at the sites rarely used this form, even though those who had seen the form rated it highly. Two sites continued to use action plan forms developed locally. At the other two

sites, physicians continued to prefer to devise their own action plans for patients.

Education Form 704-R. This form documented the patient's asthma status and knowledge of the condition. It included a section to be filled out by the patient prior to the education class and a section to be filled by the instructor at the end of the class. Two sites liked the form and were using it. The other two sites reported they did not use the form, although one of them was using the SF 600 to document that a patient had taken an asthma education class. One site suggested that the form be modified to include more blank space to write in. It also reported that patients had difficulties filling out their portion of the form.

Patient Education Video. This video educates patients on what asthma is and how they can manage it to reduce exacerbations. The implementation team at one MTF liked the patient video and showed it during their education classes. Two other MTF teams preferred to continue showing videos that they had used prior to the demonstration. The last MTF team did not use the video because it thought it was too long and lacked some needed information about self-management of asthma.

Patient Education Pamphlet. This pamphlet provides asthma patients with highlights of the key actions they can take to help manage their asthma effectively. Participating clinics at three of the MTFs distributed the education pamphlet to their asthma patients. The fourth MTF did not distribute it because they felt it was written at too high a reading level for its patient population. Implementation teams and other clinic staff at all sites recommended that patient education materials be written at the fifth-grade reading level and make heavy use of graphics and lighter use of words. It also was recommended that patient education material be made available in multiple languages, including German, Korean, and Japanese.

Guideline Key Elements Cards. These cards are reminders for providers that present the key elements and algorithms for asthma management, as defined by the asthma practice guideline. Both versions of the cards—the desktop cards and packet laminated cards—were rated highly by the physicians who had seen them. At

our first site visit, it was suggested the actual dosage for medications specific to each level of severity be added to both cards. A number of providers reported at the first site visits that they had not received these cards. When we followed up on the issue at our second visits, some physicians continued to report they had not received these cards.

Additional Tool Kit Items. At the first round of visits, some MTF staff indicated they would like to have a PowerPoint presentation available designed to introduce ancillary staff to the asthma guideline and the staff's role in its implementation. Staff also suggested that MEDCOM provide a poster displaying the asthma guideline key elements.

Information Exchange

MEDCOM created two information exchange mechanisms—a listserv and communication support—to help MTFs share implementation experiences and learn from each other.

Listserv. The asthma listserv was set up and managed by MEDCOM staff to provide communication among MEDCOM and the MTFs participating in the demonstration about new developments in asthma care, measures and data for monitoring asthma care quality, and other MEDCOM or MTF activities. The listserv became operational after our first visit to the sites, and any staff at the demonstration MTFs could register to participate in the listserv, at their discretion.

Staff on the implementation team at three of the sites generally knew about the availability of the listserv, and staff at the fourth site did not know about it. Of those who were aware of the listserv, most had either never accessed it or had accessed it only once or twice. When asked why not, many reported they were too busy to take the time to use it or were not interested. However, a few people reported accessing the asthma listserv daily, including the case manager at one site and the facilitator at another site.

Technical Support. MEDCOM used monthly teleconferences or videoconferences to communicate with the sites during the demonstration. The implementation teams from all the sites participated in

the conferences, and participants discussed implementation issues and approaches to address them. RAND staff did not participate in these conferences. MEDCOM staff also participated in the two rounds of visits for the RAND evaluation, during which they addressed questions from the sites and more generally assisted them in their implementation activities. During our site visits, the MTF teams gave generally positive feedback about the usefulness of the videoconferences.

Structure and Support at the MTFs

The MTF Environment

The four demonstration sites varied in their size and clinical assets, as well as in their previous experience with quality improvement strategies and use of clinical practice guidelines. These features, which are summarized below, influenced the strategies chosen by the MTF teams for implementing the asthma guideline and the actions they undertook to carry out the strategies.

All the MTFs served a large active-duty population and their families and had the basic clinical capabilities for the treatment of asthma, including primary care internal medicine clinics. All of them had multiple family or primary care clinics located in the hospital and, in addition, two of them ran troop medical clinics (TMCs) in buildings separate from the hospital. At all the MTFs, a mix of military and contract physicians provided primary care services. Also, one MTF had a family practice residency program with some 30 trainees. All the MTFs reported that they had low ratios of ancillary staff to providers, typically not exceeding one to one. Support staff limitations were a constraint on the MTFs' ability and willingness to take on new workload for implementing new practices.

The MTFs differed in their on-site availability of specialty clinics, including respiratory therapy, allergist, and pulmonologist. Three out of the four MTFs already had done some quality improvement work for asthma care before the DoD/VA guideline was published. Two MTFs had previously sought or were already implementing a

guideline for asthma. A third MTF was focusing on improving self-care of asthma patients prior to the demonstration.

Annual rotations and frequent deployments are inherent to the Army environments and the demonstration sites were no exception. All the MTFs experienced turnover and absences of key staff during the demonstration, making it difficult to train all providers, ensure that new procedures were communicated to all personnel at the same time, and otherwise provide continuity in the implementation of the guideline.

Baseline Climate for Guideline Implementation

As described in Chapter Two, a climate survey was administered to the command and implementation teams during the kickoff conference. The climate survey consisted of four modules that addressed motivation for guideline implementation, supportiveness of climate, attitudes toward practice guidelines, and efforts to improve quality of care (refer to Appendix C for these items).

The baseline scores on the motivation, climate, and attitudes modules for the MTF command and guideline teams are presented in Tables 4.2 and 4.3. To protect privacy, neither the names of the MTFs nor the number of respondents in each MTF are provided. There were a total of 61 respondents, of whom 17 were members of MTF command teams and 44 were on the implementation teams. The teams ranged in size from 8 to 15 members.

The command teams and implementation teams had similar views regarding the importance of all four of the measures of readiness for guideline implementation—the eight quality improvement factors, the MTFs' current status in quality improvement, the MTF climate, and attitudes toward practice guidelines (Table 4.2). Both groups gave moderately high scores to the importance of quality improvement, with average scores of 34.1 and 35.7 (of a maximum of 40), and for attitude toward practice guidelines, with average scores of 33.2 and 32.6 (of a maximum of 42). The relatively high scores they gave to the importance of improving quality and attitude toward practice guidelines suggest they were well positioned to start working

Table 4.2
Baseline Survey Scores on Quality Improvement, MTF Climate, and Attitudes Toward Practice Guidelines

	Means (Standard Deviations) for Views on Quality Activities			
Respondent Group	Importance of Improving Quality of Care (Range 8 to 40)	MTF Current Status in Quality Improvement (Range 8 to 40)	MTF Climate for Guideline Implementation (Range 7 to 28)	Attitude Toward Practice Guidelines (Range 6 to 42)
All MTFs (4)				
Command teams	34.1 (3.1)	25.4 (4.4)	14.7 (2.7)	33.2 (5.5)
Implementation teams	35.7 (3.8)	25.4 (6.1)	14.6 (4.0)	32.6 (4.8)
Combined by MTF				
Demo 1	35.5 (4.1)	26.5 (5.6)	14.0 (3.0)	32.5 (4.6)
Demo 2	34.4 (3.8)	22.0 (5.8)	13.0 (2.5)	30.5 (3.0)
Demo 3	36.3 (3.8)	25.8 (4.2)	15.5 (3.8)	34.6 (5.8)
Demo 4	34.8 (3.0)	26.8 (5.4)	16.3 (4.5)	33.9 (5.7)

with the asthma guideline. We also found that the command and implementation teams at each MTF were consistent in their ratings of the MTF environment.

A baseline motivation measure was derived for each implementation team member based on the concept that team members will be motivated to initiate guideline activities when they perceive that their efforts will lead to successful guideline implementation, successful implementation will lead to improved job performance, and improved job performance will be instrumental in obtaining desired outcomes (e.g., career progress, improved patient outcomes). We calculated motivation scores using survey responses for three factors:[1]

$$\text{Motivation score} = (\text{effort yields performance}) \times (\text{performance yields outcome factor}) \times (\text{importance of outcome factor})$$

[1] The factors are measured as agreement/disagreement that exertion of effort will help the individual or clinic perform consistently with the guideline (scale of one to seven), agreement/disagreement that their own efforts or overall clinic/MTF efforts will contribute to each quality improvement factor (scale of one to seven), and the importance of each factor (scale of one to five).

Separate average scores were calculated for individual motivation and clinic or MTF motivation, as well as for a combined average score for overall motivation. For ease of interpretation, these scores were converted to percentages of the maximum possible score. The individual and combined motivation scores for the four MTFs, shown in Table 4.3, varied from less than 46 percent to more than 81 percent. Differences across MTFs were statistically significant for the clinic motivation and combined scores but not for individual motivation. Considering the magnitude of the scores, the MTF teams were moderately motivated to pursue guideline implementation, but there did not appear to be overwhelming enthusiasm for the task, especially for the MTF identified as "Demo 2," which had the lowest scores.

Support for the Demonstration

As described in Chapter One, commanders of participating MTFs[2] were asked to appoint a multidisciplinary implementation team of eight to ten individuals to develop an action plan for the implementation and monitor its progress. These individuals represented the mix

Table 4.3
Baseline Motivation for Guideline Implementation by the Implementation Teams

	Percentage of Maximum Scores for Perceptions of Motivation by the Guideline Implementation Teams[a]		
Military Treatment Facility	Individual Motivation	Clinic/MTF Motivation	Combined Motivation
Demo 1	64.1	66.1[b]	64.9[b]
Demo 2	51.4	45.7[b]	48.7[b]
Demo 3	78.4	80.0[b]	81.6[b]
Demo 4	55.1	62.9[b]	56.3[b]

[a]The index scores have a maximum possible range of values from 1 to 245. The results reported are expressed as a percentage of the maximum score of 245. Differences among the MTFs are not statistically significant.
[b] $p < 0.05$.

[2] The MTF commander is the equivalent of a chief executive officer in a civilian hospital.

of clinical and support staff involved in delivering care for patients with asthma.

The commanders also were asked to designate a guideline champion and a facilitator. The champion was the leader of the implementation activities and the MTF team. The facilitator was to guide the implementation team in developing an implementation action plan and then to provide support to the champion and team in coordinating and managing the implementation process.

Through the climate survey and site visits, we gathered information on the level of support provided by commanders, champions, facilitators, and implementation teams. The climate survey assessed baseline attitudes before the implementation got under way, and we gathered updated information at the site visits that we could use to assess how the level of support changed during implementation.

Command Support and Accountability. Staff at three of the four sites reported that commanders had been supportive of the guideline and its implementation, although this support was passive in the sense that staff said that the commanders did not demand regular reporting on progress, and hence accountability. Multiple changes in command at one of these sites did not alter this positive, but passive, support. At the fourth site, staff were ambivalent as to the extent of command support, even though command had agreed to allocate funds to buy asthma pamphlets for patient education in addition to those provided by MEDCOM in the asthma toolkit.

Climate surveys reinforced these observations of passive command support. Although implementation team members responding to the RAND survey perceived a "good chance" that a staff member would be noticed if he or she did not cooperate with guideline implementation, they also perceived that the staff member would take "no risk" or only "slight risk" in not cooperating with guideline implementation. They also perceived that "nothing" to "very little" would be done if a staff member were uncooperative. Staff at two of the four sites, however, perceived that there would be a "good" chance that a staff member would be praised for cooperating with implementation of the asthma guideline.

As requested, all the commanders designated guideline champions, facilitators, and implementation teams and they authorized the teams' participation in the two-day off-site conference that initiated the demonstration. As communicated by the MTF implementation teams in their monthly reports and the evaluation site visits, however, when the demonstration activities began, none of the MTF commanders provided their champions or members of their implementation teams dedicated time to carry out the activities in their guideline action plans. Team members continued to be responsible for the functions they had to perform before implementation began, and the time spent implementing activities related to the asthma guideline was added to those responsibilities.

The Champions. The participating MTFs varied in their initial choice of champions to lead the asthma guideline implementation activities, and one site changed its champion early in the demonstration. Two sites designated family practice physicians as champions, one site designated an internal medicine specialist, and the last site designated the chief of pediatrics. At two of the four sites, the champions were civilians, and at the other two, the champions were junior officers. All champions reported during the site visits that they were committed to the successful implementation of the guideline, and other information gathered at the site visits confirmed they had all played an active role in training staff on the guideline.

However, during the site visits, champions reported that the lack of "protected time" allocated for implementation of the guideline hampered their ability to be effective leaders of implementation activities. Overall, the champions reported that they spent from 10 to 30 percent of their time in implementation activities of the asthma guideline. Some reported that they did not have the military rank or other professional status needed to give them the credibility (informal power) to persuade their colleagues to work with the guideline and to overcome any resistance to practice guidelines that providers might express.

The champion at one site was changed early in the demonstration. The initial champion had played a major role in the development of the asthma guideline and felt he had become a barrier in its

implementation. His high expectations that his colleagues would share his level of knowledge of the guideline and commitment to implementing it were leading to miscommunication and frustrations. He voluntarily relinquished his role to two of his colleagues, a pharmacist and a family practice physician.

The Facilitators. The demonstration MTFs selected facilitators with a variety of backgrounds to support MTF teams in their planning and execution of implementation actions. Two of the facilitators, one civilian and one military, were registered nurses assigned to utilization management, one facilitator was a military nurse case manager, and the fourth was a civilian.

The extent of involvement of the facilitators in implementation activities varied across sites. At one site, the facilitator actively led the revisions of forms and the development of new procedures for patient flows. Later, she pulled back to take a role of "objective" observer providing feedback on implementation progress. Another facilitator played a major role in generating data to monitor progress made on the asthma metrics. The other two facilitators played passive roles, leaving the coordination of activities to the champions.

The Implementation Teams. Drawing on previous experience with group processes, MEDCOM and RAND advised the MTFs to establish multidisciplinary teams of 8 to 11 members. This is based on published findings from experience with team management that suggest that too few or too many team members reduce team effectiveness, with optimal size ranging from 6 to 10 members (Cohen and Bailey, 1997; Starfield, 1998).

Three of the MTFs complied with this guidance, establishing teams of 8 to 12 members. The fourth MTF initially chose a 16-member team because it wanted to include one representative or more from all of its multiple family and specialty clinics. It later reduced the size of the team to 13 members, including four civilians that the site felt would provide continuity over time. The size was reduced because they found the larger team was difficult to manage and not productive. The membership of the teams remained relatively constant during the 15 months between the kickoff conference and our last site visit.

With a few exceptions, the implementation teams included the clinical and support staff appropriate to the implementation of the asthma guideline: primary care providers, pediatricians, pharmacists, internists, respiratory therapists, nurses, ancillary staff, and utilization and quality managers. One site included an allergist. A notable exception was a site that did not include a pharmacist on its implementation team, reportedly because pharmacy operates separately from the MTF. Against MEDCOM and RAND advice, two sites did not include a representative from ancillary staff on their implementation teams. Failure to do so resulted in resistance by the ancillary staff to adopting practice changes that required their constructive participation, which was reported to us by the MTF teams and those staff during the site visits.

In spite of staff continuity and autonomy, most of the members of the implementation teams were minimally involved in managing the actual implementation process for the asthma guideline. Implementation team members reported that the lack of dedicated time allocated to members of the implementation teams was one reason for their low involvement. Another contributing factor was that many of the key implementation actions, such as training of staff or changes made to forms, were primarily handled by the champions or facilitators, which reduced the sense of "ownership" in the implementation process by other team members.

This low participation by other MTF team members is reflected in patterns of team meetings. Two sites held no regular meetings, and the few that were held were poorly attended. The other two sites initially held regular weekly to biweekly meetings that eventually were reduced in frequency to once a month. One site created an e-mail alias to facilitate communications among members of its implementation team.

As a result, the primary role of the implementation team members was to provide across-the-MTF support and legitimacy for implementation of the asthma guideline. Utilization management and quality management members of the implementation teams at three sites were exceptions, having devoted considerable time to generating monitoring reports on the asthma metrics.

Implementation Activities and Progress

Although all sites were encouraged to start implementation of their action plans soon after returning from the kickoff conference, only two sites actually did. The other two sites did not begin implementation until five months after the kickoff conference. At one of these sites, a two-month deployment and provider resistance to the guideline forced a delay in start-up activities. In response to these delays, we adjusted our site visit schedule so that the first site visits were held in February and March 2000 instead of in January, which had originally been planned, with the second site visits six months later. We describe below the implementation strategies and activities of the demonstration sites, and we discuss the factors that appear to have affected their progress.

Implementation Strategies

The action plans developed by the MTFs at the kickoff conference, and subsequently updated as they gained implementation experience, generally addressed all four modules of the guideline: initial diagnosis, follow-up visits, emergency management of asthma exacerbations, and telephone triage. However, our review of the written plans confirmed that specific actions tended to be focused on the first two modules. All plans included activities to introduce the guideline and forms to both providers and ancillary staff, to increase patient education and case management, and to purchase spirometers or make them more readily accessible to patients.

All MTFs identified the metrics they planned to monitor on a monthly or quarterly basis using the ADS, CHCS, or chart reviews (see Table 4.4), and they planned to begin monitoring progress early and regularly. In addition, one site planned to develop a registry of current asthma patients. All sites aimed to complete implementation of all their planned actions MTF-wide within seven to nine months of the kickoff conference.

All of the metrics selected by the MTFs directly address important aspects of care as defined in the practice guideline, and data for all of them require data from the medical chart of MTF data systems

to measure. These data are not available to MEDCOM because AMEDD does not have electronic medical records and the other MTF data systems are not linked in a network. It is for these reasons that these measures are different from the indicators RAND measured in our assessment of effects of guideline implementation. We were limited to indicators that could be measured using encounter data and centrally available data on use of prescription drugs.

The draft action plans gave limited attention to specific actions to change the clinics' existing structures or procedures. The MTFs indicated they would use the MEDCOM asthma forms, improve patients' access to the clinics, or develop a system for follow-up visits. In addition, our review found that most of the specific actions outlined in the MTFs' plans were conceived as onetime actions to be taken outside of the ongoing education and managerial processes of the MTFs and their related clinics and TMCs.

At the kickoff conference, the teams were encouraged to approach implementation by undertaking actions in one clinic first,

Table 4.4
Asthma Metrics Initially Selected by the Demonstration Sites

Metrics	Fort Benning	Fort Campbell	Fort Gordon	Fort Jackson
Percentage of patients with documented severity	X		X	X
Percentage of patients initially identified who were referred for spirometry	X		X	X
Percentage of patients with spirometry in last 12 months	X			X
Percentage of patients with written action plan	X	X		X
Percentage of patients with medications appropriate to level of severity	X	X	X	X
Percentage of target group not diagnosed appropriately		X		
Percentage of inappropriate referrals to emergency center in telephone triage		X		
Frequency	Quarterly	Monthly, Quarterly	Monthly	Monthly

through which they could gain experience and correct problems identified before launching a major change in practices in all clinics and TMCs. Three of the sites used this approach, beginning implementation in one clinic and planning to expand to implementation across all MTF clinics that served asthma patients within four months. The fourth site already had been using an asthma guideline before the demonstration, and it continued its practices, expanding its patient education and disease management activities.

In general, all the MTFs followed their action plans as they began implementation, although two exceptions are worth noting. One MTF, demonstration site 1, when faced with provider resistance, scaled down its original comprehensive approach to focus on just two metrics of the guideline. Second, none of the MTFs implemented their intended changes to their telephone triage practices. Three MTFs never addressed this issue during the 12-month duration of the demonstration. The fourth MTF reported that it had tried to change the ways its telephone triage contractor advised asthmatic callers, but its efforts had been unsuccessful. Eventually, it developed its own protocol for use in telephone triage, but it had not yet implemented the protocol by the end of the demonstration.[3]

Demonstration Site 1. Initially, this MTF sought to implement comprehensive actions to address each element of the guideline, including initial diagnosis, ongoing management, emergency treatment and telephone triage. This approach met with strong resistance from providers. In addition, a lengthy two-month deployment immediately following the kickoff conference caused a loss of momentum. To address these issues, the implementation team wrote a new action plan that focused on just two dimensions of the guideline: identification of level of severity and appropriateness of treatment for the level of severity diagnosed. To support this new approach, which it saw as a first step in fully implementing the

[3] We note that such adjustments to implementation action plans are to be expected as organizations experience successes with some actions and barriers to carrying out others. For this reason, we encouraged the MTFs to adjust their plans accordingly, while remaining focused on the goal of increasing consistency with the provisions of the asthma guideline.

guideline, the site relied on clinic-by-clinic monitoring of compliance. The site also sought to increase referrals of patients to its Asthma Resource Center, which it had established prior to the demonstration to provide patient education. By the end of the demonstration, the site had implemented this first increment of the guideline in all of its clinics except pediatrics but had not yet begun to address the other elements of the guideline in all clinics.

Demonstration Site 2. This site started implementation of the asthma guideline in its family practice clinic, its largest clinic and home of the family practice residence program. In the words of the staff at the MTF, reported at our site visit, the site took a "minimalist" approach, simply distributing the asthma key elements cards and making the MEDCOM forms available. When monitoring showed low compliance rates with documentation of asthma care, the site provided more thorough training to both providers and ancillary staff. Experience gained in this pilot program led the site to establish a case management capability that focused on formalizing referrals of acute asthma patients by PCMs to asthma education and from the emergency room to the PCMs. The site also revised the content of its asthma education classes and scheduled them regularly, and it developed a list of acute asthma patients to refer for case management. Chart audits were begun early in the demonstration to guide implementation.

Implementation of the guideline at the site's internal medicine clinic, emergency room, and its numerous TMCs began in the seventh month of the demonstration, three months later than planned. Reportedly, implementation of the guideline in the TMCs was greatly facilitated by the inclusion of the physician assistants' coordinator on the site implementation team.

Demonstration Site 3. This site used the demonstration as an opportunity to reinforce its focus on patient education and case management of acute asthma cases. On ascertaining that the asthma guideline it had developed two years prior to the demonstration was consistent with the DoD/VA guideline, it decided to continue to use its own guideline and forms. In its action plan, it defined actions to strengthen referrals of patients to its asthma center, which the site had

established to provide continuity of care through case management and patient education more focused and effective than physicians could provide. However, the center was reportedly chronically understaffed and suffered from regular turnover of case managers, so it was difficult for the center to respond to increased demand for its services. The site also developed a list of asthma patients that it used to identify patients with a large number of visits for referral to case management.

The MTF's asthma guideline was already in use at all of its clinics and TMCs, although with varying degrees of success. Implementation in the TMCs was made more difficult because TMC staff reports to division command, rather than the MTF commander and because physician assistants are reluctant to mark asthma as a diagnosis because they perceive it may jeopardize soldiers' careers. By the end of the demonstration, the site had not begun to monitor the asthma metrics.

Demonstration Site 4. A year before the demonstration, this site had sought to improve the treatment of asthma patients by emphasizing self-care and the promotion of a patient action plan. With implementation of the guideline, initially at its family health clinic, the site formalized referrals to patient education and to spirometry to ensure timely reporting of results to providers. It also began to monitor the asthma metrics early in the demonstration and developed a list of asthma patients. The site delayed implementation of the guideline to its internal medicine clinic to avoid high turnover of staff during the summer.

The Implementation Process and Activities

To carry out their respective strategies, the sites were asked to introduce the guideline algorithm and supporting toolkit items to providers and staff, make changes to administrative procedures, provide patient education and self-management, and monitor selected indicators. The experiences of the four sites in each of these implementation steps are compared below.

Guideline Introduction and Training. All the sites began their implementation activities by holding education sessions for primary

care providers to introduce them to the evidence-based practices specified in the asthma guideline. Two of the sites gave group training sessions that provided continuing medical education (CME) credits while the other two provided training during a regular staff meeting. These initial sessions did not reach all relevant staff because of deployments and work schedule conflicts. At one site, 60 percent of providers participating in our focus groups said they had not attended a training session on the guideline. One site reported that staff at the TMCs were particularly difficult to reach, not only because of frequent deployments and rotations but also because staff reported to their field units. Another site also indicated that contract and resource staff had incentives that discouraged participation in training. Contractually, these providers are paid by the quantity of services they provide, and time spent in training is a diversion from this activity.

The content of the training sessions varied among the sites. Two sites centralized training and used the PowerPoint presentation included in the toolkit and available on the MEDCOM Quality Management web site. One of these sites also provided a handout from the NHLBI in the hope that it would increase provider acceptance of the DoD/VA asthma guideline. Another site used its own educational material. This site had already conducted educational programs on the appropriate treatment of asthma using the NHLBI guideline. It complemented this training with CME lectures, individual meetings between providers and case managers, and academic detailing conducted by the asthma center staff.

Of the providers at these three sites who participated in our focus groups, 90 percent had received a copy of the full asthma guideline and a copy of the laminated sheet showing its key elements. The same proportion had seen the MEDCOM encounter form 701-R and two-thirds had seen a copy of the MEDCOM patient action plan form 703-R. Form 702-R received no comment. Providers who had participated to the training sessions rated the training received "somewhat helpful" on the average.

The fourth site took a very different approach to staff training after providers in this hospital exhibited considerable resistance to

accepting the DoD/VA asthma guideline. Its philosophy was to require providers to use the guideline first and then to educate them. To overcome staff resistance, the training emphasized that implementing evidence-based clinical guidelines was a priority of the Army Surgeon General. It also emphasized that providers were expected to document their diagnosis on the patient encounter form (701-R) and to have an asthma action plan documented on form 703-R for every patient. It was made clear that the focus of the groups' discussion was to be on *how to* implement, not on *whether to* implement. The champion provided this training in each individual clinic. They had generally active involvement by the providers, in part because the MTF team made it clear that the providers had to address the practice guideline.

Having learned from the earlier low back pain demonstration that failure to train the ancillary staff led to reluctant cooperation, MEDCOM emphasized at the kickoff conference the importance of introducing the asthma guideline to the sites' ancillary and support staff and of clearly defining their roles in the implementation process. Two sites heeded this advice and gave separate formal training sessions to their clinic staff. The first site provided separate sessions for nurses, clerks, and other support staff. The content of the training sessions was developed by respiratory therapy staff, and a nurse conducted the sessions. The other site trained ancillary staff in a regularly scheduled staff meeting. The other two sites did not formally introduce the asthma guideline to their ancillary staff other than showing them MEDCOM form 701-R and instructing them to make it available in the visit rooms.

All sites recognized that they needed to offer additional and periodic training sessions for existing staff and newcomers. Because variations in work schedules and frequent deployments and rotations of staff at all levels are a fact of life in the military, some of the sites had given some thought to integrating periodic training on the asthma guideline into orientation sessions for newcomers. As of the end of the demonstration, none of the sites had yet done this. Sites continued to rely on training "on the job" by peers and, at one site, on individual training provided by asthma center case managers.

Procedures for Patient Visits. To ensure documentation of asthma diagnosis and treatment, all sites initially sought to encourage providers to use the MEDCOM encounter form 701-R or, at one site, its local equivalent. Compliance tended to be low at all sites and varied depending on the availability of ancillary staff support, primary care provider acceptance of the form, and aggressiveness of monitoring.

At three sites, the approach was to identify an asthma patient at the front desk or in the vital signs room and to ask the patient to fill out the patient portion of encounter form 701-R. At one of these sites, form 701-R was attached to the patient chart when charts were pulled out in the morning for the day's appointments. In this case, the patient was asked to fill out the form when signing in at the desk. At another of these sites, posters were placed above the sign-in desk to remind incoming asthma patients to identify themselves. The approach at the fourth site similarly sought to identify asthma patients at the front desk, and asthma was stamped on the R-600 form for those patients. The form 701-R then was placed in the exam room for the providers to fill out. Levels of compliance with these procedures varied from no compliance to about 50 percent compliance. Providers participating in our focus groups varied widely in their reported use of the form.

A variety of reasons were given for low use of the encounter form. MEDCOM had given direction that the form was meant to provide a convenient and efficient way to document asthma diagnosis and treatment, but that its use was voluntary, so long as diagnosis and treatment were documented in some fashion in the patient chart. The sites left it to individual providers to decide whether they would use the form. One site used what it characterized as a "low intensity" approach to encouraging providers to comply with the guideline, and to use form 701-R in particular. This site gave providers occasional reminders as well as feedback on practices using the results of anonymous chart audits.

Many ancillary staff perceived that use of the documentation form would add to an already heavy workload and, hence, were reluctant to use it. At one site, the ratio of support staff to ancillary staff

was as low as one to two. Feeling already overburdened, the ancillary staff had little motivation to ensure that the form was filled out and attached to the chart, especially if it required any allocation of their time to assist patients in filling it out. Because of ancillary staff resistance to the form, one site decided to bypass this staff and another site discontinued use of the form toward the end of the demonstration.

Other reasons for low use of form 701-R (or its equivalent) were providers' dislike of a checklist form, issues regarding which form to use for patients with multiple conditions, and proliferation of forms. Checklist forms are contrary to the long-standing tradition in which physicians document care by writing free-text notes on a generic encounter form in the style they prefer. For patients with multiple conditions, the use of condition-specific forms raised practical questions about which form(s) should take precedence. Finally, the growing number of condition-specific forms to fill out was a general concern at all sites. The sites encountered another issue in working with the encounter form, which involved placement of the form in the patient chart. Their understanding was that AMEDD regulations require that only the SF-600 forms can be placed in the patient chart, and the forms are to be in chronological order. Some providers expressed frustration at having to search for the form in the chart. The instructions for Form 701-R stated that this form also was to be placed in the chart in chronological order, but MTF staff were not aware of this instruction.

Standardization of ADS Reporting. By the end of the demonstration, two sites had successfully standardized coding of asthma cases using the ICD-9 code 493.1 that MEDCOM had established. These sites also had added a field for level of severity on the ADS entry form and were using it. Neither of the other two sites was coding asthma on the ADS forms as had been specified by MEDCOM.

Three of the sites provided several reasons to explain why appropriate coding continued to be an issue. First, coding is time-consuming, so it is often delayed and prone to errors. One site that checked the ICD-9 coding of its asthma encounters found inappropriate coding in nearly 50 percent of cases. Second, several sites sug-

gested that some providers hesitated to code a soldier or family member as having asthma for fear that this information could be detrimental to the soldier's career. The issue appears to be particularly salient at TMCs where physician assistants tend to code asthma patients as having "reactive airway disease," reportedly because of the stigma attached to asthma for active-duty soldiers. Another set of issues was found for basic trainees. One site suggested that the incentives for recruiters to sign up new personnel makes them less vigilant in identifying such conditions as asthma that would prevent an otherwise enthusiastic candidate from enlisting.

Formalized Referrals to Spirometry. At the beginning of the demonstration, two sites experienced long waits for spirometry readings and the return of results. One site resolved this issue by developing a consultation form and implementing a procedure for referrals from providers to the pulmonary clinic. By the end of the demonstration, spirometry was completed on the same day a patient was referred. The other site addressed its access problem by obtaining a grant that allowed it to purchase five spirometers.

Patient Education. All four sites reported that they viewed patient education as an important component of the management of asthma, but the sites varied greatly in the relative emphasis they placed on implementing education activities. They all had formalized procedures for providers to use in referring patients to patient education, but the provider had the discretion of whether or not to make such referrals. The implementation teams of all the MTFs viewed provision of separate patient education services as a way to partially relieve providers of this responsibility, but it would require that providers be willing to make the referrals to those services.

One site had made patient education the core of its approach to management of asthma patients even before the implementation of the guideline. In 1998, this site allocated considerable resources to set up an asthma center in its primary care clinic, which was staffed by a respiratory therapist, a nurse case manager, and temporary staff awaiting reassignment on "medical hold." The center provided group and individual education in asthma self-management as well as case management services, including proactive screening of emergency

room visits by asthmatic patients and screening of all asthma diagnostic codes to identify patients with high utilization of health-care resources. Automated consultations for patients referred to the center were sent through the CHCS. Both the center staff and providers report that this automated system works well. The center's staff makes appointments for patients through clinic clerks, and they follow up with patients they have not seen in a while.

Another site established an asthma resource center in 1997. This center provided education in self-management exclusively. To further encourage referrals to patient education, this site developed an appointment form, and clinic clerks were instructed to direct patients to the center to schedule an appointment. In addition, a formal procedure using the CHCS was put in place at the emergency room through which asthma patients coming for emergency care were referred both to his or her primary care physician for clinical care and to the center for asthma education services.

Patient education at the other two sites was less visible and not as well resourced. A clinic nurse provided patient education at these two sites as one component of his or her duties. At one site, respiratory therapy provided limited education on the use of peak flow meters, inhalers. and spacers but more comprehensive asthma education was not included.

The length and content of the education courses and the material used for education in asthma self-management varied among the sites. All sites provided group classes, and three sites also provided individual classes. One site required all family members to attend classes, especially if the patient was a child. The classes varied in duration from 30 to 90 minutes. At one site, the class was limited to teaching the use of peak flow meters, with no other aspect of disease self-management or inhaler technique covered. Another site also covered a number of other topics, including anatomy, physiology, medications, and triggers.

All but one site used their own educational materials that they had developed over the years. All sites used both written and visual educational tools, some of which were made available to patients to take home. As noted earlier, few sites used the patient education

material provided in the MEDCOM asthma toolkit, with the exception of the patient brochure developed by the Red Cross. Two sites used MEDCOM form 704-R in its education classes.

Despite these efforts, referrals to education were reported to be low and only about 50 percent of scheduled patients were reported to actually attend. Some providers speculated that a reason for low attendance in patient education was that patients do not want to take responsibility for their care. Some physicians were also skeptical about the effectiveness of patient self-management education. They were also concerned that they did not receive feedback about whether referred patients had actually attended classes and, if they did, what information they had acquired. Even when one site had demonstrated that patients given education had fewer emergency and clinic visits and fewer hospitalizations, providers remained unconvinced.

One possible reason for provider resistance could be lack of confidence in the education services being offered by the MTFs. Skepticism apparently was fueled by the education programs' tendency to use one-way, didactic patient education rather than collaborative, problem-solving approaches that providers feel are more effective. Patient educators at the sites demonstrated varying levels of understanding of the difference between these two educational approaches and generally followed the more didactic approach. None of the sites engaged the patient in the self-care process through collaborative goal setting with patients or followed up with patients on their success in meeting their goals.

Case Management. Two of the sites had case management capabilities in place prior to the demonstration and continued to refer patients to it. A third site, concerned about continuity of care, designated a nurse to provide case management as a result of the demonstration. Patients making frequent visits (at one site defined as 12 or more visits per year) were referred for case management. At two sites, asthma patients seen in the emergency room and inpatients were also considered for case management.

Referrals from the Emergency Room. Three sites put in place formalized referral procedures for asthma patients visiting the MTF emergency room. Patients at one site were automatically referred to

their PCM and also to the asthma center for patient education while, at another site, patients were referred only to their primary care manager. At the third site, patients were referred only to the asthma center for patient education.

List of Asthma Patients. The sites had been encouraged at the kickoff conference to develop a list of their asthma patients. All sites developed these lists, but they conceded that the lists were incomplete and contained many errors. The sites used the lists to identify patients with high frequency of visits for referrals for case management. No site made its list available to the clinics to assist in the identification of incoming patients with asthma.

Monitoring and Feedback. All sites planned to monitor the MEDCOM asthma metrics on a monthly to quarterly basis. Three of the sites actually performed monitoring using chart reviews. They completed two rounds of chart reviews within three- to six-month intervals, so they were able to track trends. They reviewed 30 to 60 charts in each round. The measures these sites monitored were:

- percentage of asthma patients with documented level of severity (three sites)
- percentage of asthma patients with spirometry in last 12 months (three sites)
- percentage of asthma patients with written action plan (three sites)
- percentage of asthma patients with medication appropriate to level of severity (two sites)
- percentage of asthma patients attending patient education classes (two sites)
- percentage of asthma patients using long-term medications (one site).

Note that this set of measures that the MTFs actually monitored differed somewhat from the set they originally had planned to monitor, which are listed in Table 4.3. One MTF dropped its use of appropriate diagnosis of asthma and appropriate telephone triage to

emergency care. Two sites added attendance at patient education classes, and one site added use of long-term medications.

The sites identified several issues that made chart reviews a poor data source for an ongoing monitoring process. One issue they experienced was the difficulty in locating patient charts. Typically, charts were found for less than 50 percent of the cases sampled. Another issue was the difficulty in retrieving data from the charts because documentation is not standardized, and relevant forms (701-R, SF-600, patient action plan) may be inserted in various places in the charts. One site partially circumvented this problem by reviewing charts on a more frequent, monthly basis.

The MTF teams indicated that they would welcome assistance from MEDCOM in designing and implementing more efficient chart reviews. They also indicated they would welcome the development by MEDCOM of ad hoc programs that the sites could use to retrieve trend data from the ADS and CHCS, which they currently do not have the skills to do on their own. Alternatively, they suggested that MEDCOM perform the monitoring function.

One site displayed the results of its chart reviews separately for each clinic and eventually planned to monitor the asthma indicators by provider. This site reported the results from its chart audits to each clinic's process improvement group for follow-up and appropriate action. A clinic's process improvement group includes providers and ancillary staff, and it meets regularly to address issues affecting the clinic. At the other sites, some providers reported they had been shown some data on the asthma metrics during the demonstration. However, many of the providers who participated in our focus groups reported that they did not know what the metrics were for the asthma guideline. The sites had given consideration to integrating monitoring of the asthma metrics into their quality management program or peer review processes, but, as of the time of our last visit, none of them had taken actions toward this end.

The champions at the sites raised the issue of how to interpret the results from the chart reviews. They suggested that MEDCOM set performance objectives for their facilities. This would bolster the

role of the champions by making providers and MTF staff accountable for meeting these objectives.

Lessons Learned

MEDCOM Support

- Having learned from an earlier implementation of a clinical guideline for low back pain, MEDCOM allocated adequate staff and other resources to support the implementation of the asthma guideline. As a result, MEDCOM could provide technical support and toolkits to the MTFs from the beginning of the demonstration, and it was responsive to their questions and requests.

MEDCOM can encourage a more proactive approach by MTFs by reviewing the action plans prior to actual implementation and suggesting changes to strengthen the MTF strategies. It also will be important to identify sources of delays or inertia and work to remove those barriers. Development of action plans for implementation of a clinical guideline is a critical step. Although the MTFs generally developed reasonable action plans, they could not complete the actions they had defined in their implementation strategies. In some cases, factors out of their control intervened (e.g., deployments of medical personnel). However, other delays in implementation could have been prevented or shortened with intervention by MTF command, the implementation teams, or clinic providers.

- The demonstration confirmed that more work was needed on the MEDCOM asthma encounter documentation form to make it usable (and acceptable) for providers. Many providers did not like the current form, stating that it lacked adequate room to write notes and was not practical to use for multiple-diagnosis cases, which reportedly represent a large share of a primary care provider's caseload.

The documentation forms should be redesigned to be simple and should leave ample room for notes. Also, the number of forms should be limited to a strict minimum. This demonstration suggested that when MTFs are provided with a considerable amount of new forms (four in this demonstration), they may be likely to disregard them.

- Once MEDCOM has revised its guideline documentation forms, it may want to consider making use of the forms mandatory. Demonstration results for both the asthma and low back pain guidelines suggest that when form use is voluntary, many MTFs and primary care providers will choose not to use it, preferring to develop and use their own forms. Such inconsistency in documentation will make it more difficult for MEDCOM to monitor performance on the guideline metrics.
- A related issue regarding use of standardized forms is the approach taken by MEDCOM to develop a separate documentation form for each guideline it is implementing. With multiple clinical guidelines being implemented, MTFs and primary care providers will be faced with several forms for the various guideline conditions, and their response may be to ignore all of them. This issue could be alleviated by establishing an automated medical record, which is under development by DoD.
- MEDCOM should provide continuing leadership in establishing mechanisms to maintain effective communications with the MTFs on guideline implementation activities. As we learned in both the asthma and low back pain guideline demonstrations, daily demands on the time of MTF staff impede their ability and willingness to take initiative to communicate with other MTFs. Thus, any mechanisms established for cross-MTF communications should be easy to access and use, to avoid barriers that might further constrain communication activities.

Support at the MTF

- The command teams of the participating MTFs need to provide visible and active support for use of the practice guideline to make clear that leadership has placed a high priority on achieving the best practices delineated in the guideline. This involves making clear statements of support, demanding accountability for making change happen, and providing appropriate staff resources for a reasonable implementation period. Such support will increase motivation for rank-and-file providers, who should be more likely to engage in use of the guideline practices when they know they will be evaluated on how well they do so.
- Regular meetings with the MTF command need to be scheduled to provide updates on progress in carrying out the implementation action plan, to review results from the monitoring of metrics, and to resolve issues that arise as new practices are being introduced.
- Additional consideration should be given to the role and composition of the MTF implementation team. With the exception of those involved in monitoring the guideline metrics, implementation team members generally were not actively engaged in carrying out the action plans. Despite limited roles, their presence on the team contributed to building ownership for the guideline and identifying feasible approaches to improving practices. Increased involvement should lead to even stronger ownership. Mechanisms also need to be put in place to facilitate regular communications among team members so they can troubleshoot issues and assess progress in carrying out their action plan. This mechanism could be regular team meetings or other alternatives, such as e-mail, that might work as well or better, depending on the team members' preferences.

CHAPTER FIVE

Effects of Guideline Implementation

In this chapter, we examine the extent to which introduction of the asthma guideline at the four demonstration MTFs changed clinical practices at those facilities. We use information from the process evaluation to assess how well providers at the demonstration sites appeared to understand and accept the guideline. We also summarize reports from the sites on their monitoring of the effects of implementation activities on clinical practices. We then report results from our analysis of encounter data on trends in clinical practices for the indicators of asthma care, comparing the demonstration sites to control sites that had not used the guideline. Finally, we compare MTF costs for health-care service to enrolled asthma patients for the two study years and assess any differences between the demonstration and control MTFs.

Provider Knowledge and Acceptance of the Guideline

There was positive to neutral acceptance of the asthma practice guideline by participants at the demonstration MTFs. Providers at two MTFs indicated, however, that it would not change their practices. One of these MTFs was already using an asthma guideline similar to the DoD/VA guideline, and participants there saw no reason to modify their practices. At the other MTF, providers believed their practices were already consistent with the guideline.

These reactions of the site implementation teams were consistent with attitudes expressed by primary care providers interviewed during the RAND site visits, which ranged from strong support to passive acceptance. Some providers said they were already practicing according to the guideline's standard of care, and some saw guidelines in general as a threat to their autonomy and not especially useful. Some positive comments also were heard from providers:

- "This guideline is long overdue."
- "Its utilization will lead to good patient outcomes."
- "We are pleasantly surprised by the quality of the guideline."
- "Its focus on severity is helpful."
- "It makes things concrete, provides uniformity of care, and serves as a reminder."

At one site, the guideline conflicted with local practice. Providers at that site did not prescribe peak flow meters to patients diagnosed with mild persistent asthma. They also pointed out that there was no medical evidence to support the guideline's requirement of an annual spirometry reading.[1]

At the end of the demonstration, providers participating in our focus groups were asked their views about clinical practice guidelines in general and the asthma guideline in particular. Most of them reported that the asthma guideline had taught them aspects of care they did not know before and had helped them provide better care to their asthma patients. Most also felt that the asthma guideline had not reduced their flexibility to treat asthma patients, but they did report that using the guideline increased the time they spent with asthma patients.

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[1] This site's champion, who also had participated in the development of the guideline, agreed that no medical evidence supported this requirement for annual spirometry but reported that it had been included in the belief that it would not get done if it were not required regularly. Regular spirometry reading was also a perceived aid in assessing the effectiveness of treatment.

These results suggest that providers were generally positive about the asthma guideline, but that taking all the steps the guideline specifies might harm their daily productivity. In addition, a significant minority of providers reported that the guideline did not help them.

Reported Changes in Clinical Practices

To learn about changes in clinical practices made by the demonstration sites, we asked the implementation team and providers in our focus groups at each site to identify which practice changes they made and whether they had evidence that documented such changes. We also reviewed progress reports from these sites and data they had developed on trends in the asthma metrics. Overall, we found evidence of some changes to make clinic practices more consistent with the guideline's recommendations, but these changes were neither strong nor widespread among the participating providers and clinics. Some examples of the reported changes are summarized below.

Changes in Referral Patterns

Providers participating in our final site visit were asked if the asthma guideline led them to increase or decrease referrals to a number of specified services. Providers at all four sites reported that they had increased referrals of patients to education programs and to spirometry. At two sites, they reported they had increased referrals to case management. Providers also reported that they increased referrals to allergy, smoking cessation, or respiratory therapy. For all of these increases in referrals, however, providers reported that their changes in referrals were not extensive. Finally, providers reported no changes to their pattern of referrals for X rays, tests for airway function, pulmonology, or the Medical Evaluation Board.

These reports represent the perceptions of the providers that participated in our focus groups, which may not be representative of all providers at the demonstration sites, who may have had less exposure to use of the practice guideline. These perceptions also may dif-

fer from objective data on changes in clinical practices, as measured with encounter or chart data.

Changes in Asthma Indicators Monitored by the Sites

Three of the four demonstration sites performed reviews of randomly drawn samples of asthma patient charts at two points in time—early in the demonstration and again a few months later. The reviews were done to monitor documentation of compliance with the clinical practices recommended by the asthma guideline and to assess the extent to which practices had changed over time.

We provide here a qualitative summary of the results of the MTFs' chart data analyses, which gives some sense of how the MTFs perceived they were progressing. The validity of the data is uncertain because they worked with small samples of cases and they did not have a standard chart abstraction method to use. In particular, the teams performing the reviews could find fewer than half of the records drawn for the sample, which increases the probability of bias.

The three sites that monitored the asthma metrics with chart data reported an increase in the documentation of asthma severity level, as well as an increase in the percentage of patients for whom use of spirometry and written patient action plans were documented. However, they found that the level of compliance with documentation remained low (according to their chart data, below 40 percent). Two sites reported no change in attendance at patient education. One site reported an increase in the percentage of patients for whom use of long-term controllers was documented. Another reported an increase in the percentage of patients for whom treatment provided was appropriate for the level of asthma severity recorded.

Changes in Asthma Medication Prescriptions

Providers participating in our focus groups were asked to indicate whether they changed the way they prescribed specified pharmaceuticals in the management of asthma patients. Some of them (but not a majority) reported that they had increased use of long-term controller medications, inhaled steroids, and long-acting $Beta_2$ agonists. Again,

these reported patterns of medication use for asthma patients reflect provider perceptions and may differ from actual patterns of use.

Analysis of Effects on Service Delivery

For the analysis of trends in service delivery for asthma patients, we compared the practices of the four demonstration sites before guideline implementation to the practices after implementation and also to the practices of six control sites that were not part of the demonstration. Refer to Chapter Two and Appendix B for details on the methods used for this analysis.

The Study Sample

As described in Chapter Two, the patient sample used for the analysis of guideline effects on asthma care at the demonstration MTFs was the MTF enrollees—i.e., TRICARE Prime enrollees who had a PCM based at one of these MTFs. This group is a subset of the Army asthma population we refer to as MTF users—i.e., all asthma patients who received care at one of the demonstration or control MTFs during the period of the study. MTF enrollees received most, if not all, of their care from the MTFs at which they were enrolled, but it does not exclude use of services from other providers.

The study sample by MTF is shown in Table 5.1. Patients enrolled at the demonstration MTFs constituted 35.7 percent of the total sample in the first study year and 37.9 percent in the second year.

Measures and Methods

As described in Chapter Two and Appendix B, six indicators were selected for analysis in the evaluation (see Table 2.4). In Chapter Three, we presented the baseline performance on these indicators for all the demonstration and control MTFs. In this chapter, we examine the extent to which the indicators changed for the demonstration MTFs during the study period as they implemented new practices for

Table 5.1
Number and Percentage of Asthma Patients Enrolled in TRICARE Prime at a Demonstration or Control MTF (MTF Enrollees), by MTF

	Study Year One		Study Year Two	
Site	Number of Patients	Percentage	Number of Patients	Percentage
All sites	12,970	100.0	11,320	100.0
Demo sites				
Demo 1	1,176	9.1	1,059	9.4
Demo 2	1,159	8.9	1,043	9.2
Demo 3	1,715	13.2	1,628	14.4
Demo 4	581	4.5	559	4.9
All demos	4,631	35.7	4,289	37.9
Control sites				
Control 1	1,635	12.6	1,280	11.3
Control 2	785	6.1	659	5.8
Control 3	736	5.7	595	5.3
Control 4	2,621	20.2	2,050	18.1
Control 5	1,747	13.5	1,558	13.8
Control 6	815	6.3	889	7.9
All controls	8,339	64.3	7,031	62.1

NOTE: *MTF enrollees* signifies beneficiaries who were enrolled in TRICARE Prime at this MTF for all of their inpatient and outpatient encounters in the SIDR and SADR data.

the asthma guideline. Our analysis tests the hypotheses listed in Table 2.1.

All of the demonstration MTFs decided to start implementing the asthma guideline in one or two of their primary care clinics, rather than attempting to introduce practice changes across all clinics serving asthma patients. Each chose the clinics that saw the largest share of their asthma patients. Because any changes in the asthma indicators in our analysis would have occurred only for patients enrolled with PCMs in the participating clinics, we separated data for patients enrolled at those clinics from that for the rest of the asthma patients enrolled at the demonstration MTFs. We refer to these clinics as the "target clinics" in the presentation of our results.

For each indicator, we present a figure displaying trends in the average values for the demonstration sites and control sites. For the three medication measures, annual values are reported for each of the

two study years. For the three measures of service-use rates, we report quarterly trends in annualized rates for the eight quarters included in the study period. Tables with data that support these figures, including individual rates for each MTF, can be found in Appendix E.

To test the significance of any observed trends, we estimated a multivariate regression model for each indicator for which the patient was the unit of analysis. The dependent variable of each model was the indicator being tested, and predictor variables were demonstration versus control, individual facility, and calendar quarter. We controlled for patient characteristics of military status, gender, and age categories in these models. We could not control for differences in asthma severity level because administrative data do not contain this information. Interaction terms were used to test differences in rates during the demonstration period relative to the two baseline quarters.

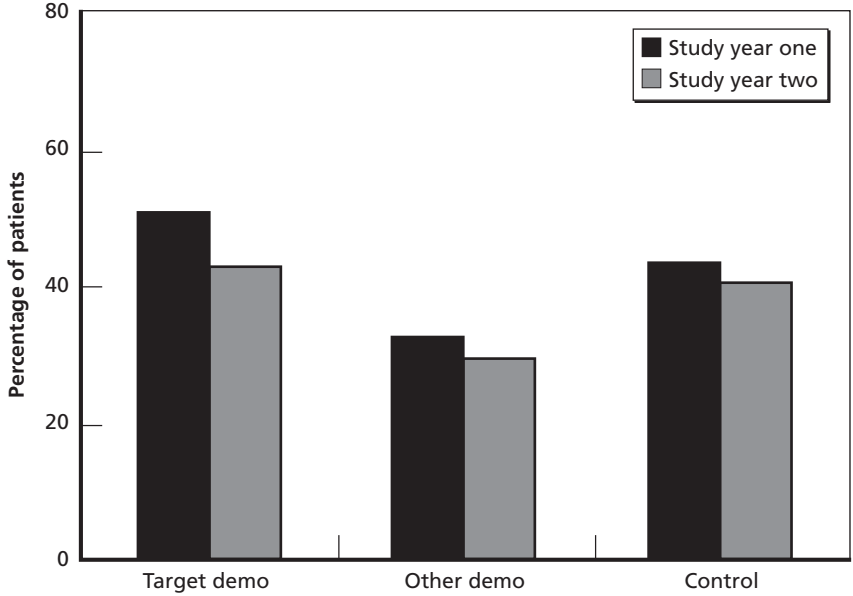
Use of Long-Term Controller Medications

The asthma guideline recommends use of long-term controller medications for patients with asthma severity greater than mild intermittent. We hypothesized that introducing more active management of asthma patients would increase the percentage of patients with prescriptions for long-term controllers, to reduce the frequency of asthma exacerbations.

As shown in Figure 5.1, the target demonstration group had the highest percentage of asthma patients with prescriptions for long-term controller medications in both study years one and two. The percentages declined from the first to second study year for all groups. Thus, we found no evidence of the hypothesized increase in use rates of long-term controllers under the guideline.

We hypothesized that introduction of more active management of asthma patients would increase use rates of complementary medications to support improved control of exacerbations. The percentage of asthma patients who were prescribed complementary medications was substantially larger in the target demonstration group than in either the other demonstration or control groups, as shown in Figure 5.2. However, we found no evidence of the hypothesized increase in

Figure 5.1
Prescription of Long-Term Controllers, for Target Demonstration, Other Demonstration, and Control Sites, by Year



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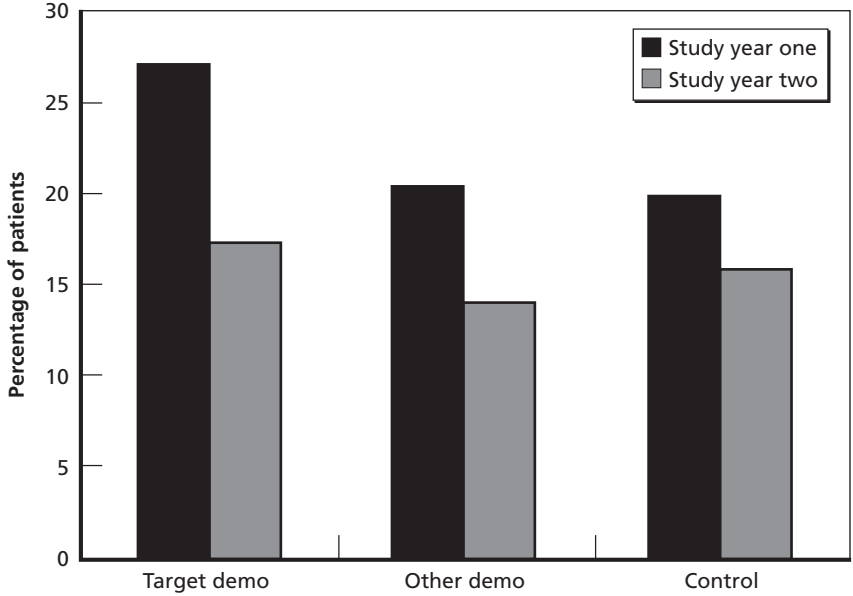
use of complementary medications under the guideline. The percentages of patients using these medications declined between study years one and two for all three groups.

Use of Short-Acting Rescue Medications for Asthma Exacerbations

With its emphasis on reducing frequency and severity of exacerbations, the asthma practice guideline recommends that asthma patients have available short-acting rescue medications for early use at times they begin having symptoms of an exacerbation. Thus, we hypothesized that introduction of more active management of asthma patients would increase the percentage of patients with prescriptions for rescuer medications.

Relatively large percentages of asthma patients had prescriptions for rescue medications in the first study year, as shown in Figure 5.3.

Figure 5.2
Prescription of Complementary Medications, for Target Demonstration, Other Demonstration, and Control Sites, by Year



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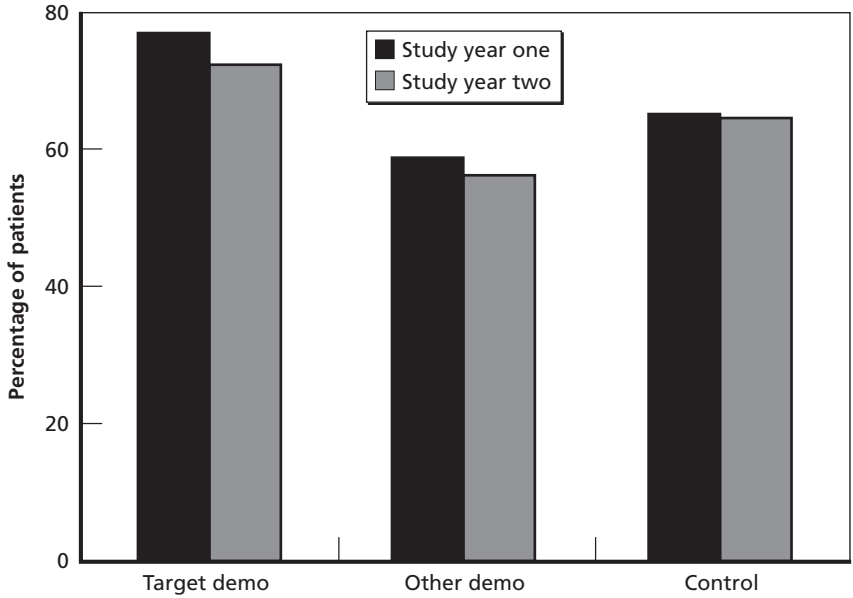
Again, the target demonstration group had the largest average percentage (77.0 percent), followed by the control sites (65.3 percent) and the other demonstration group (59.2 percent). The average percentage for the target and other demonstration groups declined slightly in study year two, while those for the control group remained essentially the same. Thus, we found no evidence of the hypothesized increase in use of rescue medications under the guideline.

Use of Outpatient Services

In Figure 5.4, we present annualized rates of asthma-related outpatient visits per 100 asthma patients for each of the eight quarters in the study period, where a visit was determined to be asthma-related if the asthma diagnostic code was reported on the encounter record. To the extent that introduction of the practice guideline affected these

Figure 5.3
Prescription of Short-Acting Rescue Medications, for Target Demonstration, Other Demonstration, and Control Sites, by Year



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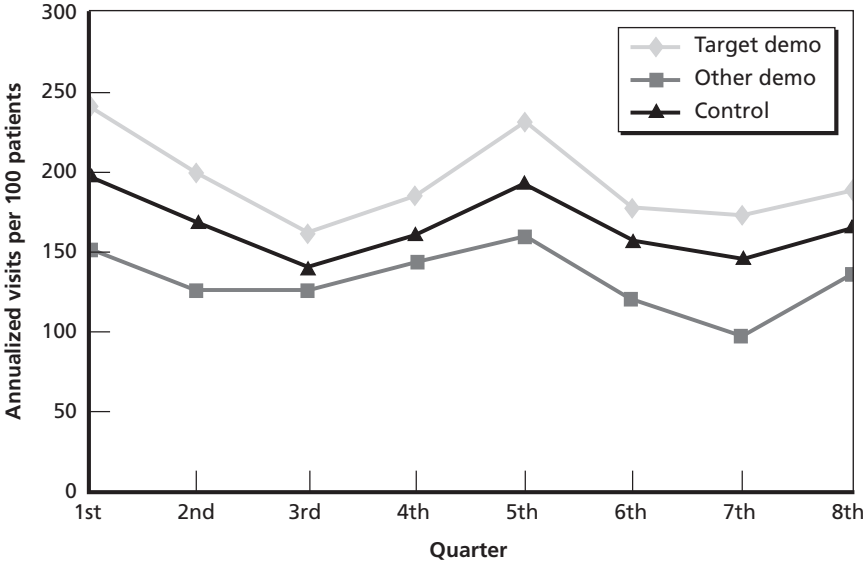
use rates, we should see a change in the trend starting in the fifth quarter, which is the first quarter after the MTFs began to work with the guideline in the target clinics.

We observe what appears to be a seasonal pattern of variation in outpatient use rates for patients in all three groups. The rates are highest in quarters one and five (January through March of each year) and lowest in quarters three and seven (July through September of each year). If introduction of the guideline affected outpatient use rates, we should observe a decline in the use rates for the target demonstration relative to the other two groups, independent of the seasonal pattern. Such a decline is not found, indicating that the guideline had no effect on overall use of outpatient services in the demonstration sites.

Figure 5.4
Trends in Asthma-Related Outpatient Visit Rates, by Target Demonstration, Other Demonstration, and Control Sites



NOTE: Annualized outpatient visit rates are calculated as four times the number of visits in a quarter divided by the number of patients in the relevant study year and applying 100 as an adjustment factor to standardize to a rate per 100 patients.
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Use of Emergency Room Services

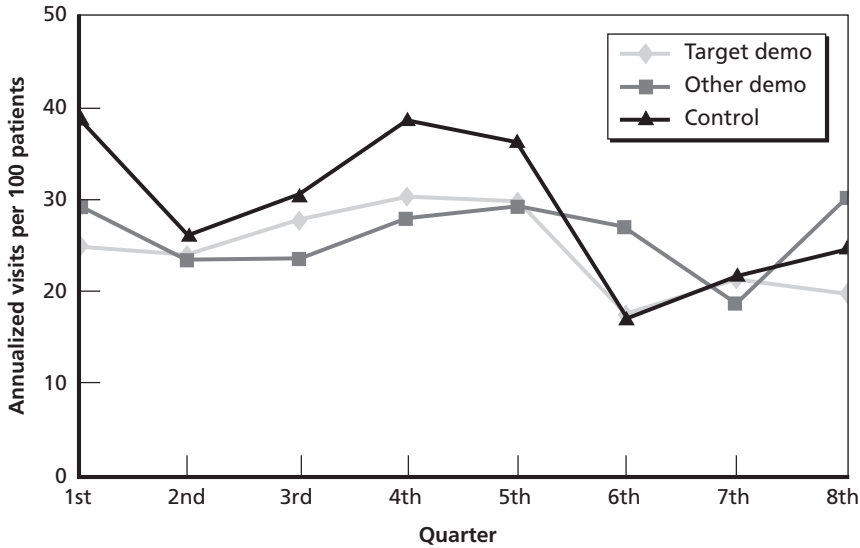
According to the practice guideline, effective management of asthma should lead to less frequent exacerbations, which in turn should reduce rates of emergency room use by asthma patients suffering an exacerbation. Thus, we hypothesized that introduction of new practices specified in the asthma guideline would contribute to a reduction in asthma-related emergency room use rates by asthma patients served by the demonstration MTFs.

We measured emergency room use as the number of asthma-related emergency room visits per 100 asthma patients. Annualized use rates were calculated for each quarter of the two study years. Control site six was excluded from this analysis because it did not have an

emergency room, so its patients had to use other facilities for which our data was incomplete.[2]

As shown in Figure 5.5, the three groups of target demonstration, other demonstration, and control sites had similar levels of asthma-related emergency room visit rates, with the control sites' rates slightly higher than those for the two demonstration groups. Visit rates for patients served by the target demonstration clinics declined in the second study year, as hypothesized, but so did rates

Figure 5.5
Trends in Asthma-Related Emergency Room Visit Rates, by Target Demonstration, Other Demonstration, and Control Sites



NOTES: Excludes control site six, which does not have an emergency room. Annualized emergency room visit rates are calculated as four times the number of visits in a quarter divided by the number of patients in the relevant study year and applying 100 as an adjustment factor to standardize to a rate per 100 patients.

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[2] We repeated this analysis with all the control sites and obtained the same results we found for the analysis reported here that excluded control site six.

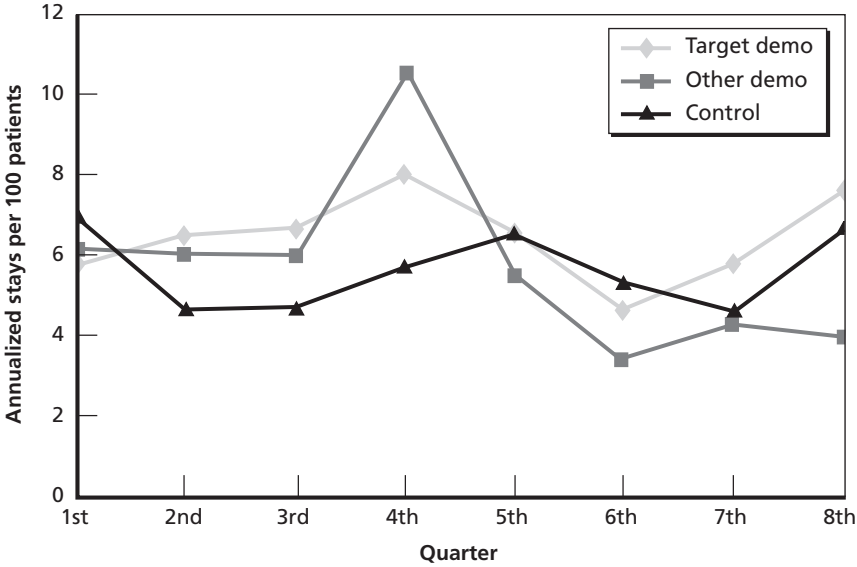
for the control sites. Therefore, we cannot conclude that the decline for the target demonstration clinics is attributable to introduction of the practice guideline. The absence of effects was confirmed by regression modeling, which found no significant difference between the groups in the reduction of emergency room visit rates for the second study year.

Use of Hospital Inpatient Services

Similar to the hypothesis for emergency room visit rates, we hypothesized that use of the asthma guideline would reduce rates of asthma-related hospitalizations for patients at the demonstration sites during the second study year. This effect would derive from improved management of care for asthma patients by the participating MTFs. In calculating hospitalization rates, we included in the counts fall admissions to either MTFs and network provider hospitals that had a diagnosis code for asthma in any diagnosis field. Annualized hospitalization rates per 100 asthma patients, calculated for each quarter of the two study years, are shown in Figure 5.6. These rates offer no evidence for the hypothesized reduction in hospitalization rates for the demonstration sites. Hospitalization rates remained steady for the target demonstration group as well as for the control sites. Only the rates for the other demonstration group declined in the second study year, which we interpret as an unrelated trend that cannot be attributed to use of the asthma guideline because the sites had undertaken interventions only in the target clinics.

Asthma-related inpatient stays represented only 45 percent of total inpatient stays for the target demonstrations and were 33 percent of total stays for the other demonstration group and control group. We also tested for trends in total hospitalization rates for patients in the three groups, to examine whether asthma management might be having a measurable impact on other reasons for hospitalization, and we found no significant change in these rates between the two study years.

Figure 5.6
Trends in Asthma-Related Hospital Inpatient Stays, by Target Demonstration, Other Demonstration, and Control Sites



NOTE: Annualized hospitalization rates are calculated as four times the number of inpatient stays in a quarter divided by the number of patients in the relevant study year and applying 100 as an adjustment factor to standardize to a rate per 100 patients.
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Estimated Costs of Care

We began the cost analysis by looking at the total costs of care for the MTF users (all asthma patients served by the ten MTFs that were demonstration or control sites for this evaluation). We looked at both the costs experienced by the MTFs for asthma care and those experienced by the patients themselves.[3] Costs were broken down by two subgroups of the MTF users—MTF enrollees (those enrolled in TRICARE Prime at the MTF) and nonenrollees.

[3] As discussed in Chapter Two, some uncertainty exists about the quality of MEPRS cost data, and the data quality varies across MTFs.

From the MTF perspective, the lion's share of costs for asthma patients are for nonenrollees, as shown in Figure 5.7. Less than half of the total costs of care for asthma patients for both demonstration and control MTFs were spent on enrollees. The shares of total costs for enrollees declined to about 40 percent for both MTF groups in the second year. The demonstration MTFs incurred a somewhat smaller share of their total costs for MTF enrollees than did the control sites, and this difference persisted in both study years. As discussed above, it is more difficult for primary care providers to manage asthma care for nonenrollees because these patients use MTF services episodically and many lack a regular primary care provider at the MTF.

Figure 5.8 shows estimated average MTF costs from the patient perspective, including total costs per asthma patient and components

Figure 5.7
Composition of MTF Total Costs for Asthma Patients Who Were MTR Enrollees and Nonenrolled Users for Demonstration and Control Sites, by Study Year (FY 1999 $)

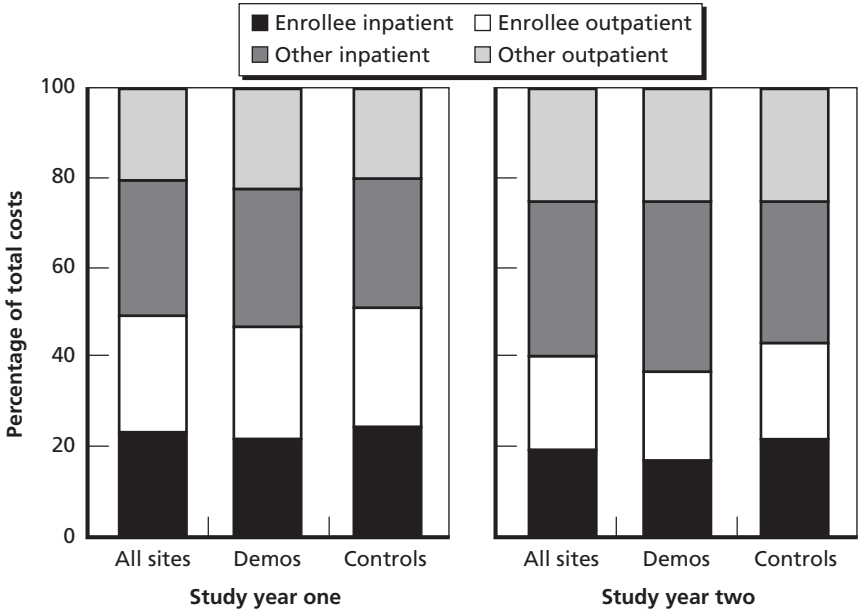

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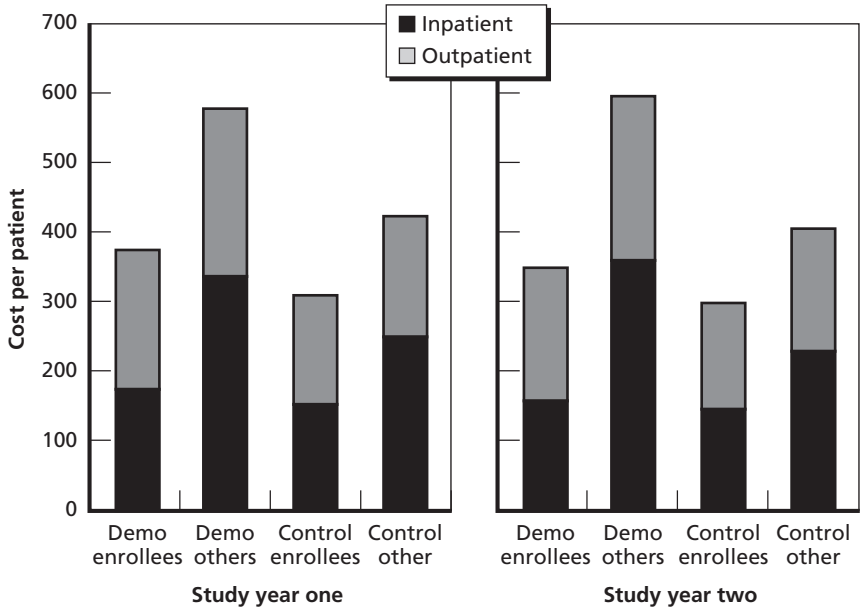
Figure 5.8
Estimated Total MTF Cost per Asthma Patient for MTF Enrollees and Other Users of the Demonstration and Control Sites, by Study Year (FY 1999 $)



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of costs for outpatient and inpatient services. Asthma patients enrolled at MTFs had substantially lower total MTF costs per patient, on average, than those using the MTFs on a more episodic basis, a difference that was found for both study years. This difference in costs is attributable to much higher MTF inpatient service costs per capita for nonenrollees.

Several possible explanations might contribute to the lower costs experienced by MTF enrollees. The enrollees might have received more regular care from the MTFs that prevented conditions or complications that would lead to a need for hospital stays or that reduced the severity of treatment needed during an inpatient stay. An alternative explanation might be that nonenrollees were more likely to seek care only when they experienced a health problem, at which time they would make heavier use of specialty care, hospitalization, and

other more costly services when they entered the system. Enrollees would be receiving more regular care in primary care clinics, which have lower unit costs than specialty care. One might also speculate that enrollees obtain relatively more inpatient care from community providers than the nonenrollees do, but this explanation is counterintuitive because enrollees are expected to obtain care at the MTF where they are enrolled except when the MTF does not offer the services needed.

Overall Costs of MTF Services

In this part of the cost analysis, we examine overall average costs for asthma patients at the demonstration and control MTFs, comparing costs for study years one and two. We consider separately average costs for MTF enrollees and for those who were not enrolled but used the MTF services. As described earlier in the report, our cost study had two objectives: to gain an understanding of the costs that MTFs incur for health-care services for asthma patients and to evaluate whether introduction of the asthma practice guideline had observable effects on those costs for MTFs participating in the demonstration.

Costs for MTF enrollees. The aggregate and per-patient MTF costs for asthma patients enrolled at the MTFs are presented in Table 5.2. The demonstration MTFs incurred an estimated $1.7 million in costs for services to enrolled asthma patients in the first study year, and their costs decreased to $1.5 million in the second study year. This decrease was the result of both a decrease in the number of patients (from 4,631 to 4,289 patients) and a slight decline in per-patient costs (from $374 to $348 per patient). These cost estimates were smaller than those for the control MTFs, which incurred an estimated $2.6 million in the first year and $2.1 million in the second year. The larger costs for the control MTFs reflected their larger number of asthma patients—75 to 80 percent more asthma patients were enrolled at the control MTFs than at the demonstration MTFs. At the same time, the control MTFs had much lower total costs per patient ($310 and $296 per patient in years one and two, respectively) than the demonstration MTFs.

Table 5.2
Estimated MTF Costs for Asthma Patients Who Were MTF Enrollees at the Demonstration and Control MTFs, Study Years One and Two

	All Sites	Demonstration Sites	Control Sites
Study year one			
Number of patients	12,970	4,631	8,339
Aggregate costs			
Total	$4,312,885	$1,730,737	$2,582,148
Outpatient	2,273,675	929,529	1,344,146
Inpatient	2,039,210	801,208	1,238,002
Costs per patient			
Total	332	374	309
Outpatient	175	201	161
Inpatient	157	173	148
Study year two			
Number of patients	11,320	4,289	7,031
Aggregate costs			
Total	$3,573,992	$1,493,795	$2,080,197
Outpatient	1,882,271	818,878	1,063,393
Inpatient	1,691,721	674,917	1,016,804
Costs per patient			
Total	315	348	296
Outpatient	166	191	151
Inpatient	149	157	145

NOTE: All costs are in 1999 dollars that were estimated by adjusting 1998 unit cost estimates by an inflation factor of 1.4 percent.

In the first study year, outpatient services for asthma patients represented an estimated 53.7 percent of the total estimated costs for the demonstration MTFs, compared to an estimated 52.1 percent for the control MTFs. The second study year mix of costs for inpatient and outpatient services were similar to the first year for both the demonstration and control MTFs.

With the introduction of new care management practices to prevent asthma exacerbations, we would expect outpatient use rates and related costs for the demonstration MTFs to increase and inpatient care and costs to decrease as this care helped reduce the frequency of exacerbations. As shown in Table 5.2, the total average cost per patient for asthma patient enrollees decreased for both the demonstration and control MTFs (by 6.8 percent and 4.5 percent, respectively) from baseline to study year two. For demonstration MTF

enrollees, the average outpatient cost per patient decreased by 4.8 percent (from $201 to $191) and the average inpatient cost decreased by 9.0 percent (from $173 to $157). At the same time, the average outpatient cost per patient for enrollees at the control MTFs decreased by 6.3 percent and average inpatient cost decreased by 2.6 percent.

The change in per-capita cost for the demonstration MTFs is assessed relative to the change for the control MTFs, which represents the temporal trend of how costs might have changed at the demonstration MTFs in the absence of new practices under the asthma guideline. The demonstration MTFs experienced a net reduction in per-capita costs relative to the change in costs for the control sites. The use rates for outpatient visits and inpatient stays did not change between study year one and two, however, as we reported above in Figures 5.4 and 5.6. These results suggest that there may have been a change in mix of outpatient visits or inpatient stays toward less costly services.

Costs for nonenrollees. The costs of care for nonenrollees using the demonstration MTFs are presented in Table 5.3. Total costs for the demonstration MTFs were an estimated $2.0 million in the first study year, increasing to $2.6 million in the second year. The total costs for the control MTFs increased slightly from $2.5 million to $2.7 million between the two years.

Unlike the costs for MTF enrollees, costs for inpatient services represented more than half of total costs of care for nonenrollees for both the demonstration and control MTFs. Growth in the number of patients using MTF services contributed to increased aggregate costs for both groups.

Total per-capita costs increased in study year two for nonenrollees at the demonstration sites but declined for those at the control sites. Per-capita outpatient care costs at the demonstration MTFs were virtually the same for both study years ($217 and $219 per patient), while these costs increased slightly for the control MTFs. It was the inpatient costs that accounted for the increase in per-capita costs at the demonstration MTFs, whereas inpatient costs decreased slightly at the control MTFs.

Table 5.3
Estimated MTF Costs for Nonenrollee Asthma Patients Using Care at the Demonstration and Control MTFs, Study Years One and Two

	All Sites	Demonstration Sites	Control Sites
Study year one			
Number of patients	10,109	3,808	6,301
Aggregate costs			
Total	$4,453,834	$1,990,383	$2,463,451
Outpatient	1,836,008	826,121	1,009,887
Inpatient	2,617,826	1,164,262	1,453,564
Costs per patient			
Total	441	523	391
Outpatient	182	217	160
Inpatient	259	306	231
Study year two			
Number of patients	12,060	4,768	7,292
Aggregate costs			
Total	$5,322,632	$2,583,281	$2,739,350
Outpatient	2,260,564	1,046,217	1,214,346
Inpatient	3,062,068	1,537,064	1,525,004
Costs per patient			
Total	441	541	376
Outpatient	187	219	167
Inpatient	254	322	209

NOTE: All costs are in 1999 dollars that were estimated by adjusting 1998 unit cost estimates by an inflation factor of 1.4 percent.

Variations in Costs Across Facilities

Within each of the demonstration and control groups, we found substantial variation among individual MTFs in baseline levels of costs of care per patient and changes in those costs between study years. In Tables 5.4 and 5.5, we present the total and per-patient costs for our sample—asthma patients enrolled at the demonstration or control MTFs. Estimated costs for enrollees at the demonstration sites are in Table 5.4 and those for enrollees at control sites are in Table 5.5.

Total costs per MTF enrollee varied more widely across the demonstration sites in the baseline year (from $262 to $437 per enrollee) than in the second study year (from $298 to $353 per enrollee). These sites also varied somewhat in the share of total costs per enrollee that were attributable to outpatient's costs.

Table 5.4
Estimated Costs of Outpatient, Inpatient, and Total Services for Asthma Patient MTF Enrollees at the Demonstration Sites, Study Years One and Two

	Number of Patients	Outpatient Services		Inpatient Services		All Services	
		Total Cost	Cost per Patient	Total Cost	Cost per Patient	Total Cost	Cost per Patient
Study year one							
Demo 1	1,176	233,286	198	280,824	239	514,110	437
Demo 2	1,159	231,745	200	243,457	210	475,202	410
Demo 3	1,715	375,397	219	213,692	125	589,089	343
Demo 4	581	89,100	153	63,236	109	152,336	262
Study year two							
Demo 1	1,059	150,837	142	222,817	210	373,654	353
Demo 2	1,043	171,563	164	184,938	177	356,501	342
Demo 3	1,628	401,751	247	195,171	120	596,922	367
Demo 4	559	94,727	169	71,991	129	166,718	298

NOTE: All costs are in FY 1999 dollars that were estimated by adjusting 1998 unit cost estimates by an inflation factor of 1.4 percent.

Table 5.5
Estimated Costs of Outpatient, Inpatient, and Total Services for Asthma Patient MTF Enrollees at the Control Sites, Study Years One and Two

	Number of Patients	Outpatient Services		Inpatient Services		All Services	
		Total Cost	Cost per Patient	Total Cost	Cost per Patient	Total Cost	Cost per Patient
Study year one							
Control 1	1,635	441,699	270	251,998	154	693,697	424
Control 2	785	128,353	164	92,536	118	220,889	281
Control 3	736	83,958	114	60,268	82	144,226	196
Control 4	2,621	322,024	123	336,867	129	658,891	251
Control 5	1,747	253,835	145	352,049	202	605,884	347
Control 6	815	114,277	140	144,283	177	258,560	317
Study year two							
Control 1	1,280	336,025	263	175,308	137	511,333	399
Control 2	659	94,973	144	84,945	129	179,918	273
Control 3	595	65,560	110	50,007	84	115,567	194
Control 4	2,050	240,707	117	393,547	192	634,254	309
Control 5	1,558	185,558	119	254,375	163	439,933	282
Control 6	889	140,570	158	58,621	66	199,191	224

NOTE: All costs are in FY 1999 dollars that were estimated by adjusting 1998 unit cost estimates by an inflation factor of 1.4 percent.

The individual MTFs in the control group also varied in both the levels of total costs of care per enrollee and the extent to which those costs changed from baseline to study year two (Table 5.5). Costs in study year one ranged from $196 to $424 per patient, and those for study year two ranged from $194 to $399 per patient. The per-capita costs for some of the control MTFs declined in study year two while those for other control MTFs increased.

Summary

- The RAND analysis found no changes in the demonstration MTFs' performance on the six clinical practice indicators we tracked that could be attributed to introduction of the asthma practice guideline in the demonstration sites.
- All three indicators for use of asthma medications declined from the first to second study year, which was the reverse of the hypothesized direction of change.
  Service use indicators did not show change that could be attributed to the guideline. Outpatient visit rates for the demonstration MTFs did not change between years one and two, although we observed seasonal variations for all three study groups. Emergency room use rates declined in the second study year for the target demonstration group, but this effect could not be attributed to use of the guideline because rates also declined for the other two groups. Hospitalization rates did not change over time for the target demonstration or control groups, and a decline in the average rate observed for the other demonstration group could not be attributed to use of the guideline because the sites were not implementing it in those clinics.
- The cost analysis indicated that a substantial share of MTF costs for asthma patients during the study years were incurred for patients not enrolled at the MTFs, especially for use of inpatient services.
- The cost analysis also found a decrease between the two study years in per-patient costs for enrolled patients at the demonstra-

tion MTFs. Costs also decreased for the control MTFs but by a smaller percentage. It should be noted that based on our analyses, which did not control for variation of other variables that might impact costs of care (such as level of service use, etc), it is not possible to conclude that the observed changes costs noted above can be attributed to the implementation of the asthma guideline.

CHAPTER SIX

Synthesis of Findings from the Demonstration

In this chapter, we synthesize the factors influencing the successes and limitations of the asthma guideline demonstration. We begin by discussing the implications of our findings regarding the implementation process, including an evaluation of how well the demonstration performed on the six critical success factors presented in Chapter One of this report. Next we discuss the implications of our analysis of the effects of the asthma guideline implementation on the clinical practice indicators. We will also discuss the implications of our cost analysis. Then we will describe data issues that emerged from the demonstration that are likely to affect other MTF guideline implementation and monitoring efforts. Finally, we provide our recommendations.

Findings on the Implementation Process

Implementing the Guideline Practices

In assessing lessons from this demonstration regarding the progress of MEDCOM and the MTFs in practice guideline implementation, it is necessary to look at the MEDCOM and MTF activities separately. Although the MEDCOM staff already had experience working with guideline implementation activities as the asthma demonstration started, the participating MTFs still were new to the process and were learning new methods during the demonstration.

As MEDCOM began work on the asthma guideline demonstration, the MEDCOM staff already had strengthened their capabilities based on lessons from the earlier low back pain guideline demonstration, and the MEDCOM organizational infrastructure had been further developed to better support the MTFs. The number of MEDCOM staff had been expanded, it had a developed Web site, and it had well-established procedures for developing guideline toolkits. As the asthma demonstration started, this infrastructure was in full operation and the low back pain guideline was being implemented across the AMEDD system. This new MEDCOM capability yielded more effective start-up and continuing support for the MTFs participating in the asthma demonstration, which was readily seen by our direct observation of its activities as well as feedback from the MTFs during the site visits.

At the MTF level, the process evaluation documented that participating MTFs made observable progress in introducing changes to achieve evidence-based clinical practices as specified in the asthma guideline. By the end of the ten-month demonstration period, however, the MTFs still were working on getting new practices into place in the selected clinics they chose to work on the guideline, and none had progressed to implementing these practices across all relevant clinics. Lack of experience appeared to slow their initial implementation pace, but observable progress in their activities occurred between the first and second site visits. The MTFs had some notable success in putting into place new capabilities (case management, expanded patient education, list of asthma patients, monitoring of asthma metrics) and procedures (formal referrals from emergency room to PCM, to patient education, and to spirometry) in support of the asthma guideline. However, they were not equally successful in gaining the commitment of providers to use these new or expanded resources, often because providers thought that use of the new practices would increase their workload. In addition, none of the sites was able to address the telephone triage component of the guideline.

Six Critical Success Factors

Research on practice guideline implementation has documented that a commitment to the implementation process, including use of multiple interventions, is required to achieve desired changes to clinical practices. In Chapter One, we presented six critical success factors for making lasting changes in MTFs' clinical and administrative processes. We discuss here the extent to which this demonstration realized these success factors and implications for progress in implementing practice improvements.

- **Leadership commitment at the MTF, regional, and command levels.** This demonstration had somewhat more positive support from the leadership of the participating MTFs than had been provided in the earlier low back pain guideline demonstration, but attitudes by leadership at the regional and system levels tended to be mixed. For the MTF that already had been working with an asthma guideline before the demonstration started, the MTF leadership was committed to the process, and its main concern was how to build on their earlier work most effectively as the DoD/VA guideline went into the field. For the other three MTFs, the command teams generally supported the implementation teams as they undertook the implementation process, but they did not establish this work as a key MTF priority. At the MEDCOM level, leaders had differing views about the guideline, and negative feedback on the guideline's value and effectiveness was expressed throughout the study period.
- **Monitoring of progress.** The monitoring track record during the asthma guideline demonstration was mixed. The MTF teams focused on monitoring the extent to which the new clinical practices they had introduced were being used (e.g., documentation of asthma severity in patients' charts). This focus is appropriate when first beginning to work with new practices because it allows verification that these practices actually are becoming an integral part of clinic processes. The MTFs also performed chart reviews to collect the needed data to assess status on DoD/VA asthma measures. However, no monitoring

of asthma metrics was being performed by MEDCOM, with the exception of the analyses performed for this evaluation. For fully effective performance tracking, monitoring also needs to be done at the system level.

- **Guidance and support to the MTFs by MEDCOM.** By the time the asthma guideline demonstration began, MEDCOM had expanded its staffing and other resources, and we observed MEDCOM staff providing regular policy guidance and technical support during the demonstration to help the MTFs implement practice improvements for asthma care. The MTF teams reported that MEDCOM's committed support was helpful to them and they were pleased to have it. This commitment establishes a foundation on which to build as future practice guidelines are implemented across all MTFs in the Army health system.
- **Guideline champions who are opinion leaders.** The participating MTFs identified well-respected physicians to serve as guideline champions for the asthma demonstration, and these physicians showed a commitment to leading the implementation activities for their facilities. However, the champions could only make a time-limited commitment to the initiative, and later in the demonstration, they reported they were tiring of the concentrated effort or had to turn their attention to other priorities. This finding repeated the experience of the champions participating in the low back pain guideline demonstration.
- **Resource support for champions.** The MTF commanders authorized and supported the champions in leading the implementation of the asthma guideline. However, the only tangible resource support for the champions was for their attendance at the kickoff conference. The champions neither received dedicated staff time for their implementation activities nor were they relieved of any of their other responsibilities. As a result, the champions performed the implementation work in addition to their regular workload, which contributed to their inability and unwillingness to sustain the champion role on a regular basis. The facilitators designated by the MTF commander provided

some staff support to the MTF champions, and much of this support role was part of the facilitators' regular jobs in the MTF quality management offices.

Lack of resource support to the champions appears to have contributed to the slow start experienced by many MTFs in implementing their action plans. It may also have been a factor in the MTFs' inability to achieve the extent of practice improvements that was intended.

- **Institutionalization of new practices.** At the time of the last process evaluation site visit, the participating MTFs had made progress in introducing improved asthma management practices in some of their primary care clinics, but they had not yet achieved sustainable practices in those clinics. None of them had yet begun to extend the new practices into other clinics to achieve guideline implementation throughout the entire facility. To support continued efforts to achieve sustainability, the MTFs were developing regular education sessions for providers, clinic staff, and newcomers to the MTF.

Effects of Implementing Practice Improvements

Outcome Measures

Our analysis of the effects of use of the asthma practice guideline on practices found no changes in the clinical practice indicators that we tracked. All three indicators for use of asthma medications declined from the first to second study year, which was the reverse of the hypothesized direction of change. Outpatient visit rates for the demonstration MTFs did not change from year one to year two. However, we observed seasonal variations for each group of MTFs in the study—the demonstration sites, the targeted clinics within the demonstration sites, and the control sites.

We found no change in emergency room visit rates and hospitalization rates. These findings suggest that either MTFs have not yet implemented sufficient practice improvements to achieve changes in the measures, that the changes have not had sufficient time to pro-

duce the expected improvements, or that the measures used did not adequately capture the full extent of practice changes that have occurred.

Potential Contributing Factors

Several factors may potentially have contributed to these results.

Insufficient Authority of New Program. By definition, a demonstration is the first field attempt to work with new practices, and therefore it lacks the full authority of a program officially implemented across an entire system.

Length of Study Period. In addition, one year is a short time in which to expect to find meaningful changes in performance on many of the measures of interest for quality improvement programs. For the asthma guideline, we would first expect to observe changes in the processes and procedures used to deliver care because that is where the MTFs focused their implementation strategies. As the guideline is institutionalized, we should be able to observe changes in the clinical practice indicators.

Interaction of Effects in Response to Practice Changes. The lack of observed improvement could also have resulted in part from an interaction of opposing effects in response to practice changes. For example, better classification of asthma severity could result in more patients being reclassified at the "mild intermittent" level, and the accompanying reduction of medications might offset the effect of reclassifications to higher severity levels.

Insufficiency of the Measures Used. Because the service-use measures are limited to counts of events, they cannot detect changes in practice that occur within each of those events and in related services. Other indicators more specific to the practices MTFs did change might have shown improvements. For example, data provided by the MTFs from their medical chart abstractions suggested that improvements had been achieved in many areas, including documentation of asthma severity, regular use of spirometry, and development of patient action plans. MTFs also reported improvements in providing treatment appropriate for the level of asthma severity recorded.

If accurate, these data would represent important first steps toward widespread application of more active care management for asthma patients. However, as noted earlier in the report, we did not have much confidence in the data the MTFs developed from chart abstractions because of small samples, missing charts, and differences in methods across MTFs, all of which can introduce bias into their results.

Related measurement factors might also explain why we did not see the expected changes in the use of asthma medications. Achieving a change in use of these medications involves three steps, at any of which the process may break down. First, the provider must prescribe the medication as appropriate for the asthma severity. Second, the patient must fill the prescription, which will be more likely to occur if the patient is well educated on how the medication is part of the management of his or her asthma, how the medication effects a reduction in exacerbations, and how to manage side effects. Finally, the patient must actually take the medication as instructed by the provider. Failures in the first two steps will be captured in the analysis of pharmacy data. Failure in the last step will not be captured but could affect rates of emergency room visits and hospitalizations because the medications cannot help prevent exacerbations if the patient is not taking them.

Inadequate Emphasis on the Role of Self-Care by the Patient. The implementation or the measures used to evaluate implementation effects also might not give adequate attention to the role of the patient in his or her asthma care. The active involvement of the patient is critical for successful management of his or her asthma. Patients typically do not perceive asthma to be life threatening, although it certainly has an effect on their quality of life and can put them at risk of increased morbidity or mortality. To the extent that patients do not comply with self-care plans, their inaction may contribute to lack of observed effects of the guideline on such indicators as emergency room visits or hospitalizations.

The demonstration sites reported little or no progress in increasing attendance at patient education sessions, which were intended to help patients become active participants in their care.

Information obtained during the process evaluation highlighted inadequacies in patient education activities, including problems with the design of the education programs themselves, limited receptivity of providers to referring patients to education, and lack of increase in attendance in the programs. In addition, none of the measures used by either the demonstration MTFs or the RAND analysis directly addresses the actions taken by the patient for self-care and appropriate use of prescription asthma medications.

Costs

While we did not find changes in any of the indicators tracked, we did find evidence of lower costs for those MTFs that had implemented the guideline compared to those who did not. These conflicting results highlight the difficulty of isolating the many factors that affect outcomes. It is quite possible that factors other than the MTFs' guideline implementation actions contributed to the observed cost reductions. For example, it is possible that changes in outpatient service mix or in the intensity of care during hospitalizations led to lower costs for care of enrollees in the demonstration MTFs.

After new care management methods are in place for a while, it will be important to track inpatient use rates and costs to identify trends and longer-term effects. Once several years of cost information are available, it will be possible to discern trends related to practice changes from normal year-to-year fluctuations in health-care needs.

The cost analysis also found that a substantial share of MTF costs for asthma patients during the study were incurred for patients not enrolled at the MTFs, especially for use of inpatient services. This finding has implications for how best to serve these nonenrollees, considering both issues of care management for episodic users of the facilities and efficient use of outpatient and inpatient resources.

Data Issues

Accurate assessment of MTFs' performance in implementing treatment guidelines requires the capability to routinely generate accurate

and reliable data on the indicators monitored. Pertinent to this need, we identified three critical data issues that need to be addressed:

- **Inconsistent coding of diagnoses and procedures.** Effective monitoring of performance in treating asthma (or some other condition) requires consistent coding of diagnoses and procedures in the outpatient encounter records. MEDCOM has established standard codes for asthma, but at the time of the demonstration these codes had just been introduced and were not used consistently by the demonstration MTFs.
- **Unavailable data.** At the system level, data needed to calculate many indicators (e.g., laboratory or radiology data) were incomplete, were obtained from separate data extraction processes of varying quality, or were not currently available.
- **Absence of an asthma registry.** The Army health system lacks any sort of centralized registry to provide complete information on all asthma patients in the system that can be accessed by MTFs wherever they may be. In the absence of this data resource, asthma patients might not be identified or information on their past care and asthma status might be lost as personnel and their families move to new locations.

Recommendations

All of these uncertainties reinforce both the difficulty of documenting effects of practice improvements on asthma care outcomes and the need to continue to track performance longitudinally. Through the accumulation of data over time, significant trends can begin to be detected, and the regular feedback of data to the MTFs from this process will help them to determine where they need to focus future efforts.

Ultimately, a practice guideline cannot be said to be implemented until lasting changes in practices are made. Yet all of the MTFs participating in this demonstration had difficulty integrating

the new practices into normal, ongoing MTF clinic operations. This finding highlights the need for focused attention by the leadership of MEDCOM and the MTFs to communicate clearly that achieving best practices is a system priority. MEDCOM also needs to continue to support and reinforce the MTFs' efforts by providing technical support and establishing an effective monitoring system to provide feedback to the MTFs on their progress.

We summarize here our recommendations for improving the implementation of the asthma guideline.

- **MEDCOM should establish consistent monitoring standards for performance metrics.** Centralized monitoring standards will be important to ensure that consistent data are being collected and reported. Only with this consistency can MEDCOM and the MTFs have confidence in the accuracy of observed differences across MTFs and changes over time in the indicators being tracked. To achieve this consistency, standardized coding for patient status or procedures will need to be implemented effectively across the Army MTFs. Some progress has been made in the demonstrations in defining standardized codes to identify patients (e.g., low back pain patient codes), status of condition (e.g., asthma severity), and specific procedures (e.g., foot exams for diabetes). However, these codes have not been used consistently by all MTFs, with the result that the data aggregated at the system level for these variables cannot be trusted.

  MEDCOM will need to consider data and technology issues when it makes decisions regarding how to establish an effective system-level information base with complete and consistently defined data on the performance indicators being monitored. One option would be to establish a centralized system to collect the data directly from automated data systems, perform analyses in the central office, and generate trend reports to the MTFs. Another option would be for MTFs to collect and analyze data locally and then report to MEDCOM, which would then aggregate the individual MTF results into trend reports. To support this approach, MEDCOM would need to define consistent

measurement methods and standards for the MTFs to use, and it would have to perform regular audits for measurement consistency to ensure the integrity of the data for effective performance monitoring.

- **MEDCOM should work with the MTFs to establish performance objectives on the asthma metrics.** Three of the four sites monitored the asthma metrics during the demonstration. The implementation teams did not feed this performance information back to the providers and other clinic staff, however, so they would have empirical knowledge of their performance on key aspects of care. Neither did they use this information to hold clinics or providers accountable for their performance. Both of these steps are essential to effective use of monitoring for improving clinical care performance. To ensure that performance information improves clinical practices, monitoring of the asthma metrics should be integrated into the MTFs' quality management or peer review programs, and the MTF commanders should review processes and results regularly.
- **MEDCOM should develop software programs necessary to allow the MTFs to retrieve CHCS and ADS data.** MTFs currently have difficulty retrieving ADS and CHCS data for use in the monitoring process. To address this difficulty, the MTFs requested that MEDCOM provide them with the "ad hoc" software programs needed to extract the data. Accurate coding of asthma diagnosis and severity in the ADS data is also required to identify these patients for analysis. MEDCOM established a standard code for asthma but needs to provide specific instructions on coding responsibilities and timeliness, as well as effective techniques for sampling and retrieving information from patient charts for auditing purposes.
- **As MEDCOM monitors the asthma metrics across MTFs, it needs to identify where improvements in quality and consistency of care are needed.** The MTFs were given considerable flexibility to develop implementation strategies that reflected each MTF's unique capabilities and prior experiences with asthma treatment improvement projects and guidelines. Each

MTF chose to emphasize different components of the guideline and differed in how widely they implemented the guideline in their TMCs and various other clinics. We believe this flexibility helps to ensure that each team can address the clinical practices most in need of improvement at its own MTF. On the other hand, such flexibility involves some risk that, when a team meets staff resistance, it might pursue only expedient actions, which would slow progress toward the AMEDD goal of achieving consistent practices across as well as within facilities. By continuing to monitor the metrics closely, MEDCOM can determine whether to give greater direction to MTFs with regard to which aspects of the guideline are to be emphasized and implemented uniformly.

- **MEDCOM needs to establish clear procedures and expectations for the use of forms.** Although sites were told that the use of the forms provided by MEDCOM was voluntary, participants at some of the MTFs still thought that use of the forms was mandatory. Other sites chose not to use the forms, but they did not provide clear alternative methods to ensure that asthma diagnosis and treatment were being documented appropriately. As a result, standardization of information was lacking and uncertainty arose in the MTFs about the procedural steps they should have been taking. MEDCOM needs to clarify its expectations concerning the use of forms, particularly for patients with multiple conditions for which two or more practice guidelines apply.
- **MEDCOM needs to further define the role of patient education in treatment processes of chronic conditions, while MTFs need to ensure that they are using the most effective patient education techniques.** The issue of patient education has increased in salience for AMEDD because many of the guidelines it has implemented are for chronic conditions that require self-care management by patients for effective overall management of the condition. All MTF teams participating in the demonstration said they considered patient education to be an important component in improving self-care management of

asthma, and they sought to strengthen both the content of their education programs and procedures for referrals to those programs. All the teams reported low incidence of provider referrals, however, and they reported that providers tended to be skeptical about the effectiveness of education provided by the MTFs. They also found it difficult to motivate patients to attend classes and take responsibility for their care. MEDCOM needs to establish clear standards for patient education and ensure that MTFs have adequate resources and tested educational methods. Part of the problem with the programs' effectiveness may have stemmed from the didactic lecturing approach used. MTFs should adopt a collaborative, problem-solving approach, which has been shown more effective for such courses.

- **MTFs need to integrate training on clinical guidelines into their ongoing education for current personnel and into the orientation for incoming primary care providers *and* ancillary staff.** At the start of the demonstration, the participating MTFs sought to introduce and train primary care providers on the asthma guideline in one CME session. In addition, some of the sites did not initially train the ancillary staff on the new guideline, expecting that it would be sufficient to show them the encounter form and tell them to use it. However, this minimalist approach to training was inadequate, and implementation teams often found that the training session tended to turn into a discussion of *whether* to implement the guideline rather than *how* to implement it. To train all primary care providers to desired levels of knowledge, it became clear that multiple and ongoing training sessions would be required, as providers deployed or rotated in and out of the MTFs.
- **MTFs need to integrate new practices into normal clinic operation—i.e., the way they "do business" for patient care.** A practice guideline cannot be said to be implemented until such lasting changes in practices are made. Reasons for this inability to "institutionalize" the new practices include omission of needed actions from the action plans, passive leadership support, resistance to change by providers and clinic staff, lack of

clarity on staff responsibilities and authority to make changes, and lack of accountability for achieving desired results. To help MTFs make lasting practice improvements, MEDCOM needs to communicate clearly that achieving best practices is a system priority, and it should continue to support and reinforce the MTFs' efforts by providing technical support and establishing an effective monitoring system to track and provide feedback to the MTFs on their progress.

APPENDIX A

Hypotheses for Effects of Improved Asthma Care Practices

Initial Asthma Diagnosis

The first set of measures addresses the use of spirometry to establish (or to rule out) the diagnosis of asthma in patients ages six or older. The guideline recommends use of spirometry during an initial asthma work-up and annual spirometry for those with confirmed asthma. We hypothesize that asthma guideline implementation will

- increase use of spirometry among "probable adult asthma patients" and
- increase use of spirometry among "possible undiagnosed adult asthma patients."

Asthma Follow-Up Management, Including Medication Management

These measures apply to *probable asthma patients* and their encounters. We hypothesize that implementation of the guideline will

- increase the percentage of patients for whom asthma severity level is assessed during asthma visits,
- increase use of annual spirometry for asthma patients, and
- decrease number of repeat emergency room visits and hospital readmissions for asthma.

The guideline emphasizes appropriate use of medication as part of follow-up management. We hypothesize that implementation of the asthma guideline will be associated with

- increased prescribing of long-term controller medications for persistent asthma,
- increased prescribing of quick-relief medications for all asthmatics,
- shift in medication utilization from quick-relief medication toward long-term controllers,
- decreased percentage of asthma hospitalizations or emergency room visits for which the patient has no previous prescription for a long term controller,
- decreased percentage of hospitalizations or emergency room visits for which patients have no prescription for long-term controllers immediately after discharge, and
- increased percentage of patients referred for asthma education.

Exacerbation Management

Implementation of the asthma guideline should result in

- increased use of spirometry associated with an asthma emergency room visit,
- increased use of oral corticosteroids associated with an asthma emergency room visit,
- increased number of asthma cases followed-up after a hospital discharge, and
- increased use of pulse oximetry at ER visits.

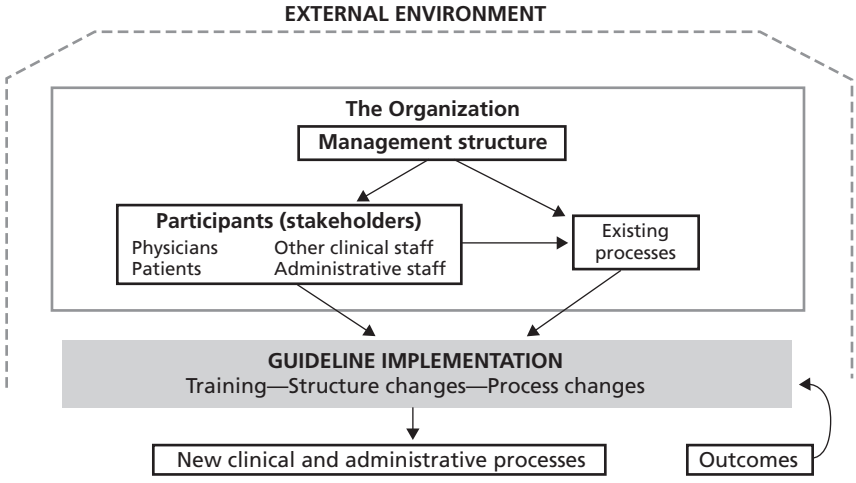
APPENDIX B

Evaluation Methodology

Process Evaluation

To capture the full dynamics of a process as complex as practice guideline implementation, it is important to take into account the roles and interactions of the many aspects of the system in which the guidelines are being implemented. Figure B.1 is a diagram of relationships among the different levels of a health-care organization during guideline implementation, the stakeholders involved, and the dynamics of the implementation process.

Figure B.1
A System View of Guideline Implementation



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A variety of stakeholders need to be considered to ensure that individuals involved in implementing new practices anticipate possible impacts on the stakeholders and responses that might be expected from them. These groups include treatment program leadership, middle management, the clinical and administrative staff working with program residents, and the clients themselves. The implementation team itself consists of important stakeholders who not only serve as team members but also have other job responsibilities.

Information was collected about the actions involved in practice guideline implementation for participating MTFs, the dynamics of the change process, and responses of participants to their experiences with the process. Similarities and differences in the attitudes, motivations, and preferences of the stakeholders were considered as the process evaluation information was collected and results were synthesized. To capture changes in structures, processes, and issues as guideline implementation moved forward, site visits were conducted to collect information at the baseline and at two follow-up times, as shown in Table B.1.

A formative evaluation approach was used throughout the implementation process and evaluation. In addition to the site visits, we used routine progress reports and maintained an ongoing communication process to provide a structure through which imple-

Table B.1
Dimensions Addressed by the Process Evaluation

	Baseline	Month Three	Month Nine
Structure and organization	X	X	X
Culture and climate	X		X
Current practices	X	X	X
Environmental context	X	X	X
Stakeholders' attitudes	X	X	X
Implementation plan		X	X
Changes in clinic processes		X	X
AMEDD support systems		X	X
Staff involvement		X	X
Patient roles and reactions		X	X
Monitoring progress		X	X
Effects on stakeholders		X	X

Table B.2
Dimensions Addressed by the Process Evaluation and Data Collection Methods

	Document Materials	Monitor Reports	Individual Interviews[a]	Focus Groups	Culture Survey
Environmental Context					
How supportive were the culture and climate?					X
How did the culture and climate change?					X
What were the other factors affecting implementation?			X	X	
The Implementation Plan					
What key guideline elements are priorities?	X	X	X	X	
What information is needed to identify priorities?			X	X	
How is guideline team organized?	X		X	X	
How does guideline team operate?			X	X	
How was guideline introduced to staff?	X	X	X	X	
Planned Changes to Processes					
What process changes did MTFs identify?	X	X	X	X	
Which changes did MTFs implement?		X	X	X	
What factors supported or slowed changes?		X	X	X	
How were implementation plans changed?	X	X	X	X	
AMEDD Systems for Implementation					
What help was received from MEDCOM on implementation?		X	X	X	
How useful was implementation toolkit?		X	X	X	
How useful were KMN, communications?		X	X	X	
Did MEDCOM help in the monitoring role?		X	X	X	
Clinical, Administrative Staff Effects					
What were the attitudes of MDs, other staff, at the start?			X	X	X

Table B.2—continued

	Document Materials	Monitor Reports	Individual Interviews[a]	Focus Groups	Culture Survey
What were the MD and other staff roles in implementation?			X	X	
Were the MDs motivated to adopt new practices?			X	X	
What were the effects of changes on MDs and responses?					
What were the effects on other staff workload, demands?					
Roles and Reactions of Patients					
What were patients responses to changes in care?			X	X	
How did the team manage patient reactions?			X	X	
How helpful were patient education materials?			X	X	
What were the effects on physician-patient relationships?			X	X	
Measuring Implementation Progress					
What were the indicators MTF selected for monitoring?	X	X			
What was the MTF data system for monitoring?	X	X	X	X	
What were the monitoring lessons and actions taken		X	X	X	
How useful was monitoring to staff?			X	X	

[a]Individual interviews included one-on-one interviews and written questionnaires completed by key participants.

menting MTFs could get assistance from each other, MEDCOM, or RAND.

Both qualitative and quantitative data collection methods were used in the process evaluation to collect information on a set of questions that cover the dimensions shown in Table B.1. Shown in Table B.2 are the specific topic areas covered and relevant data collection methods. Interviews and focus groups with the implementation team, providers and clinic staff, quality management staff, and other par-

ticipants yielded information on the dynamics of the implementation process. Focus groups were conducted with three types of participants: the implementation team, providers, and other clinic staff. Participants in each stakeholder group were asked questions regarding their attitudes toward guideline implementation, how they worked with the practice guideline, how they were affected by the implementation process, and issues or concerns they identified. Semistructured interview methods were used for all interviews, group discussions, and focus groups, working from lists of questions to cover during each session.

A brief survey regarding stakeholders' attitudes toward practice guidelines and quality improvement processes was administered at baseline and the final site visit. The survey at the final site visit also included questions about education received on the guideline, actions taken to implement the new practices, and how those actions affected providers and clinic staff.

Documents and materials also were important sources of information for the process evaluation. These included written information about the MTF structure and management, policies and procedures, data collection and monitoring, and materials developed by the MTF implementation teams as they prepared and carried out their action plans to change practices. The materials provided the primary documentation on the actions planned by the team, changes made to clinic processes, resulting events, and actions taken to monitor their progress.

Evaluation of Effects (Outcomes)

The evaluation of the effects of the asthma practice guideline demonstration was designed to work entirely with administrative data. Ideally, these data would have included a master enrollment file for beneficiaries using the Army MTFs along with files containing data on health service encounters. Unfortunately, although a master TRICARE enrollment file contains centralized data on all beneficiaries, these data were not available for use by AMEDD. Therefore, we

had to work entirely with data from the health service encounters, including SIDR, SADR, and MTF pharmacy data for MTF services and HCSR and NMOP data for network provider services. An extensive process of data extraction, variable derivation, and diagnostic analyses was carried out to

1. identify correctly the asthma population served by the Army MTFs during the two-year study period,
2. select the study sample for the analysis of guideline effects on service delivery, consisting of the subset of the asthma population enrolled at any demonstration or control MTF, and
3. establish a database of all health-care encounters for the study sample.

We first document here the specific steps involved in the data extraction process and variable specification to achieve these three work products. Then we summarize the codes used to define the variables used for the analysis of demonstration effects.

Overview of the Data Extraction Process for the Asthma Study

Two rounds of data extraction and file construction were performed in collaboration with PASBA to establish the data required for our analyses. In round one, we extracted data necessary to identify all the asthma patients served by any Army MTFs or health centers during the two study years, and we established a data file containing a record for each patient along with descriptive data on them that could be obtained from the administrative data. In round two, we extracted data on all encounters for the subset of patients enrolled at one of the MTFs in the demonstration or control groups, which included their use of any military or network provider services for any reason.

Round-One Data Extraction Specifications

SADR Data Files

Record extraction rules: Keep all encounter records from the SADR (MTF outpatient) files that meet the following criteria:

- Encounter date between October 1, 1998, and December 31, 2000.
- All individuals eligible for DoD health-care benefits, including active-duty personnel, dependents, or retirees in any service as well as all other eligible groups.
- Have a code of 493.xx for asthma in any diagnostic field (we also obtained records for patients with bronchitis diagnosis but decided to exclude these patients from the sample).
- Treated at any Army MTF or clinic (all Army DMIS IDs, including clinics and TMCs).

The following variables were extracted from the SADR file data:

Alternate care value
Appointment status type
Beneficiary category
Calendar year (created by PASBA)
ID for MTF treating the patient
Disposition code
Diagnosis codes 1 through 4
Encounter date
ID for MTF where enrolled in Prime
Patient Zip code of residence
MEPRS code for clinic of service
MTF location
Patient date of birth
Patient gender
Sponsor Social Security number (SSN)
Family member prefix

SIDR Data Files

Record extraction rules: Keep all encounter records from the SIDR (MTF inpatient) files that meet the following criteria:

- Admission date between October 1, 1998, and December 31, 2000.

- All individuals eligible for DoD health-care benefits, including active-duty personnel, dependents, or retirees in any service as well as all other eligible groups.
- Have a code of 493.xx for asthma in any diagnostic field (we also obtained records for patients with bronchitis diagnosis but decided to exclude these patients from the sample).
- Treated at any Army MTF (all Army DMIS IDs, including clinics and TMCs).

The following variables were extracted from the SIDR file data:

Alternate care value
Date of admission
Admission source
Beneficiary category
Calendar year (created by PASBA)
Date of disposition (discharge)
Type of disposition
ID of MTF of service
MTF name
MEPRS code for inpatient unit
Diagnosis codes 1 through 8
Date of disposition (discharge)
Patient Zip code of residence
MTF location
Number of diagnoses
Patient date of birth
Patient gender
Sponsor SSN
Family member prefix

MTF Pharmacy Files

Record extraction rules: Keep all records from the MTF pharmacy files that meet the following criteria:

- Beginning date of service between October 1, 1998, and December 31, 2000.
- All individuals eligible for DoD health-care benefits, including active-duty personnel, dependents, or retirees in any service as well as all other eligible groups.
- At least two prescriptions from the list of asthma medications (listed below) using Therapeutic Class Code and National Drug Code provided by the PEC.
- Filled a prescription at any Army MTF pharmacy (all Army DMIS IDs, including clinics and TMCs).

The following variables were extracted from the MTF pharmacy file data:

Sponsor SSN
DEERS dependent suffix (DDS) (family member code)
Patient date of birth
Patient age
Gender
Patient category
Enrollment status
Enrollment DMIS ID code
Fiscal year
Prescription fill date
Generic name
Product description (name and dosage)
National Drug Code
Days supply
Quantity
Dose form
Strength
Refill code

Outpatient Network Provider (HCSR) Files

Record extraction rules: Keep all encounter records from the HCSR Outpatient files that meet the following criteria:

- Beginning date of service between October 1, 1998, and December 31, 2000.
- All individuals eligible for DoD health-care benefits, including active-duty personnel, dependents, or retirees in any service as well as all other eligible groups.
- Have a code of 493.xx for asthma in any diagnostic field (we also obtained records for patients with bronchitis diagnosis but decided to exclude these patients from the sample).
- Reside in the catchment area of an Army MTF or clinic. Keep all records coded equal to any of the Army facility parent DMIS IDs, including health centers and MTFs. This will pick up people residing in the parent catchment area even if they used a freestanding clinic with a separate DMIS ID.

The following variables were extracted from the HCSR outpatient file data:

Beginning date of service
Beneficiary category
Patient catchment area
Calendar year
Defense Enrollment Eligibility Reporting System (DEERS) dependent suffix
Diagnoses 1 through 4
Date of birth
End date of service
Enrollment DMIS ID
Enrollment DMIS parent region
Enrollment status
Health service region
Patient age
Patient gender
Patient Zip code of residence
Primary diagnosis
Sponsor SSN
Sponsor service branch

An additional variable that we did not request was the "type of service" variable, which identifies the specific type of outpatient visit for which the HCSR claim was submitted. This variable would have been used to identify visits to network provider emergency rooms, which should have been included in the indicator for emergency room use rates. This variable should be included in any future database used for monitoring this indicator.

Inpatient Network Provider (HCSR) Files

Record extraction rules: Keep all encounter records from the HCSR Inpatient files that meet the following criteria:

- Beginning date of service between October 1, 1998, and December 31, 2000.
- All individuals eligible for DoD health-care benefits, including active-duty personnel, dependents, or retirees in any service as well as all other eligible groups.
- Have a code of 493.xx for asthma in any diagnostic field (we also obtained records for patients with bronchitis diagnosis but decided to exclude these patients from the sample).
- Reside in the catchment area of an Army MTF or health center. Keep all records coded equal to any of the Army facility parent DMIS IDs, including health centers and MTFs. This will pick up people residing in the parent catchment area even if they used a freestanding clinic with a separate DMIS ID.

The following variables were extracted from the HCSR inpatient file data:

Admission date
Beginning date of service
Beneficiary category
Patient catchment area
Calendar year
DEERS dependent suffix
Discharge status code
Primary diagnosis
Diagnoses 1 through 8
Enrollment DMIS parent region
Date of birth
End date of service
Enrollment DMIS ID
Enrollment status
Patient age
Patient gender
Patient Zip code of residence
Sponsor SSN
Health service region
Sponsor service branch

National Mail Order Pharmacy (NMOP) Files

Record extraction rules: Keep all records from the NMOP files that meet the following criteria:

- Beginning date of service between October 1, 1998, and December 31, 2000.
- All individuals eligible for DoD health-care benefits, including active-duty personnel, dependents, or retirees in any service as well as all other eligible groups.
- At least two prescriptions from the list of asthma medications (listed below) using Therapeutic Class Code and National Drug Code provided by the PEC. First pull records using Therapeutic Class Code and then pull by National Drug Code from that subset of records.

The following variables were extracted from the NMOP file data:

Alternate care value
Clinic Zip code + 4
Calendar year
DEERS dependent suffix (DDS)
Patient date of birth
Patient Zip code of residence
Prescription transaction date (date filled, not date posted)
TRICARE region code

Enrollment DMIS ID
Enrollment parent DMIS ID
Gender
National drug code
Sponsor service branch
Sponsor SSN
Therapeutic class code

List of Asthma Medications

Clenbuterol Hydrochloride
Albuterol
Albuterol Sulfate
Albuterol Sulfate/Ipratropium
Aminophylline
Aminophylline-Ephedrine-amobarbital
Beclomethasone Dipropionate
Bitolterol Mesylate
Budesonide
Cromolyn Sodium
Dexamethasone Sodium Phosphate
Dyphylline
Ephedrine Hydrochloride
Ephedrine Sulfate
Ephedrine-Potassium Iodide
Epinephrine
Epinephrine Bitartrate
Flunisolide
Flunisolide/Menthol
Fluticasone Propionate
Guaifen/Dyphylline/Ephedrine/PB
Guaifen/Dyphylline/P-Ephedrine
Guaifen/Theophylline Anhyd/P-Ephedrine
Guaifen/Theophylline/Ephedrine/PB
Guaifenesin/Dyphylline
Guaifenesin/Oxtriphylline
Guaifenesin/Theophylline Sodium Glycinate
Guaifenesin/Theophylline
Guaifenesin/Theophylline/Ephedrine
Ipratropium Bromide
Isoetharine Hydrochloride
Isoproterenol Hydrochloride
Isoproterenol Sulfate
Levalbuterol Hydrochloride
Metaproterenol Sulfate
Montelukast Sodium
Nedocromil Sodium
Oxtriphylline
Pirbuterol Acetate
Salmeterol Xinafoate
Terbutaline Sulfate
Theophylline/Ephedrine/Potassium Iodide/PB
Theophylline/Isoproterenol/EPD/Potassium Iodide
Theophylline Anhydrous
Theophylline/Dextrose 5%-water
Theophylline/Ephedrine/Hydroxyzine
Theophylline-Iodinated Glycerol
Theophylline-Potassium Iodide
Triamcinolone Acetonide
Zafirlukast
Zileuton

Round-Two Data Extraction Specifications

Two steps were involved in the final data extraction that was conducted during round two. First, we created the unique identifier for all individuals identified as asthma patients using the round-one data. Then we extracted data on all encounters for the subset of patients who were continuously enrolled at one of the demonstration or control MTFs during each of the two study years.

Creation of the RAND ID

A single RAND ID was created for each person that corrected the identifiers for people with incorrect or multiple family member prefix (FMP) relationship variables in the encounter and claims data. This identifier consisted of the sponsor's SSN plus a two-character relationship identifier selected based on the data available to us in the encounter and claims data we used to identify our patient population. For each encounter or claim record, we identified the combination of the sponsor SSN and the date of birth of the individual receiving the service, which were the basis for establishing the RAND identifiers.

The unique RAND ID was established in a two-step process. We first created two files that identified all DDS and FMP codes for each unique SSN/patient birth date combination: the first file contained all of the DDS codes reported in the network provider and NMOP claims files for each SSN/patient birth date combination, as well as counts of the total records with each DDS. The other file contained all of the FMP codes in the SIDR, SADR, and MTF pharmacy records for each SSN/patient birth date combination, as well as counts of the total records with each FMP. Then we combined the information from these two files, generating a single relationship variable for each sponsor SSN/patient birth date in the encounter and claims data.

Combining the information from these two files, a single relationship variable was generated for each sponsor SSN/patient birth date in the encounter and claims data. The RAND ID variable was created by combining the sponsor SSN and the new relationship variable. Precedence was given to the DDS code because this is supposed

to be consistent throughout the system, whereas the FMP code is only consistent within facility:

- If there was only one DDS, the relationship variable was set to that DDS.
- Otherwise, the variable was set to the DDS with highest number of occurrences.
- If there was no DDS, the variable was set to the FMP with highest number of occurrences.

This coding process changed the relationship code for an estimated 1.1 percent of the patient population. For less than 0.75 percent of the cases, multiple SSN/birth date combinations received the same relationship variable assignment. Most of these were cases for which the date of birth was entered incorrectly (e.g., month and day switched), which we corrected. Some were real errors in assignments, which were not corrected.

When we created the unique RAND ID variable to identify patients correctly in the database, we appended this variable to each of the encounter or claims data records so that data in the master file could be linked as accurately as possible to service-use data for each patient. Using these data, we created a single summary file that captured most of the relevant information from the phase one encounter and claims data.

Creating a Unique Patient Identifier. The first step necessary to define the study population and establish a master file for the analysis was to establish a unique identifier for each patient in the database. This was a challenging step because the identifiers on the MTF encounter records (SIDR, SADR, MTF pharmacy) were established separately from the identifiers on the network provider claims (inpatient, outpatient, NMOP). As a result, some of the identifiers on the MTF records are incorrect.

When an eligible individual enrolls in TRICARE, he or she is assigned a unique identifier consisting of the SSN of the primary beneficiary (sponsor) plus a suffix code, called the DDS code, that

identifies the relationship of the individual to the sponsor (e.g., self, spouse, child). For example, multiple children or spouses are coded in sequential order with codes 1 through 19 designated for children and codes 30 through 39 designated for spouses. Because these identifiers are assigned in the centralized TRICARE data system, we know that each identifier is a unique code that accurately identifies a person. All network provider claims use these identifiers with the DDS code.

The TRICARE data system is not accessible to the local MTFs, so they use a separate identifier coding system based on the same logic as the TRICARE identifiers, where the identifier consists of the sponsor's SSN plus a suffix code, called the FMP code, to identify the relationship to the sponsor. The codes for family member status used by the FMP code are the same as those for the DDS code. However, because the MTFs do not have access to a central database on the family members, MTF personnel may code spouses or children incorrectly because they may not be aware of previous spouses or older children. As a result, some individuals could be assigned someone else's health-care encounter in our analysis if we did not correct FMP codes before constructing our analysis file.

To address this issue, we created a unique RAND identifier using the process described above. We then created the two files described in the process above and appended the RAND ID to each of the encounter or claims data records.

Establishing the Patient Master Files. We created a master file for use in our analysis, each of which contained a record for each asthma patient identified. This file contained one record for each asthma patient served by any Army MTF or health center during the two study years. Each record contained the patient's identifier variable created using the RAND IDs; summaries of the number of encounter or claim records of each type; enrollment summary variables; place of service summary variables; and patient demographic information of age, gender, and family relationship.

The study sample used for the analysis of demonstration effects was the subset of the patient population who had been continuously enrolled in TRICARE Prime with a PCM at one of the MTFs included in either the demonstration or control group. This smaller

study sample was identified using variables on their TRICARE Prime enrollment history that were derived using enrollment data from the encounter and claims data. A patient who was reported in all encounter or claims records as always being enrolled at one of the demonstration sites was assigned an enrollment code equal to "1," and one who was reported as always being enrolled at a control site was assigned a code equal to "2." A separate variable on the file identified the MTF at which the patient was enrolled.

Creation of Analysis Master Files

Two summary files containing patient demographics and other characteristics were created using the phase one encounter data. One file contains one record per person per study year; the other file contains one record per person. Summary variables were derived by coding for each variable on individual encounter or claim records and summarizing them at the person level based on the unique RAND ID codes. First, the following variables were created for each claim record.

Study Year	Study Year of April 1 to March 31, where year = 0 is for 1999–2000 and year = 1 for 2000–2001
Demo-control	Demo = any claim is for service in a demonstration MTF or indicates that the person is enrolled in a demonstration site Control = any claim is for service in a control site or indicates that the person is enrolled in a control site Other = no claims for service in either a demonstration or control site Note: For network provider claims, this variable is identified based on the MTF catchment area variable or by a Zip code matched to an Army DMIS ID
Active-duty	Identifies active-duty personnel based on beneficiary category variable
Army	Identifies Army personnel based on beneficiary category variable

Enrollment ID	Identifies whether person enrolled to network, MTF, or not enrolled based on enrollment DMIS ID

Then the variables were summarized by person and study year. Each data source (e.g., SIDR, SADR, PEC) was summarized by person and year, and data in these summary files then were combined. In addition to the variables described above, place of service and enrollment summary variables were created. Finally, patient demographic variables for age and family relationship were created. The variables were defined using the following coding:

DMIS IDs for MTF location of service	DMIS IDs are the unique identifier codes assigned to each MTF or Army health center. An array of all DMIS IDs for MTFs that were locations of service for the patient's MTF encounters during the study year.
DMIS IDs for TRICARE Prime enrollments	An array of all DMIS IDs for MTFs where the patient was enrolled, as recorded in the patient's MTF encounters during the study year.
User population	Takes one of the following values for location of service for the study year. Based on the location of service DMIS ID for each MTF claim. Always Same = all nonmissing DMIS IDs for study year are the same and, for the second year, also are the same as the last DMIS ID for the fourth quarter of the previous year. Same for SY, No Match with Previous SY = all nonmissing DMIS IDs for the study year are the same but not the same as last DMIS ID for the fourth quarter of the previous year. Same for SY, No DMIS Previous SY = all nonmissing DMIS IDs for the study year are the same and no DMIS ID for the fourth quarter of the previous year. Not the Same = nonmissing DMIS IDs are not the same for the study year. No Location Information = any other conditions.

Enrolled population	Takes one of the following values for enrollment information for the study year. Based on the enrollment DMIS ID for each MTF or HCSR claim. Always Same = all nonmissing enrollment DMIS IDs for study year are the same and, for the second year, also are the same as the last DMIS ID for the fourth quarter of the previous year. Same for SY, No Match with Previous SY = all nonmissing enrollment DMIS IDs for the study year are the same but not the same as the last DMIS ID for fourth quarter of the previous study year. Same for SY, No DMIS Previous SY = all nonmissing enrollment DMIS IDs for the study year are the same and no DMIS ID for the fourth quarter of the previous year. Enrolled, Not the Same = nonmissing enrollment DMIS IDs exist for the study year but are not the same. PEC Claims Only for Year = MTF pharmacy records exist but no enrollment DMIS IDs on service-use records for the study year. Never Enrolled in Year = neither any enrollment DMIS IDs on service-use records nor any MTF pharmacy records for the study year.
Type of TRICARE Prime enrollment	Takes one of the following values for type of enrollment for the study year: Enrolled to Demo = enrollment DMIS ID is ever a demo site in study year. Enrolled to Control = enrollment DMIS ID is ever a control site in study year. Enrolled to Network: Demo = enrollment DMIS ID is ever network, patient Zip code in demo catchment area, and place of service DMIS ID is ever a demo site. Enrolled to Network: Control = enrollment DMIS ID is ever network, patient Zip code in control catchment area, and place of service DMIS ID is ever a control site. Enrolled to Network: Other = last enrollment

	DMIS ID for study year is network in demo or control catchment area and place of service DMIS ID is never a demo or control site. Enrolled to Other MTF = last enrollment DMIS ID for study year is not missing and is not within networks of interest. Never Enrolled in Year = enrollment DMIS ID is missing for entire study year and no MTF pharmacy claims. PEC Claims Only for Year = MTF pharmacy records exist but no enrollment DMIS IDs on service-use records for the study year.
Analysis population	Indicates whether person is in the analysis population for the study year. Based on enrolled population (enrpop). 1 = If "enrolled population" variable is "Always Same" or "Same for SY, No DMIS prev SY" and the first enrollment DMIS ID is a demonstration site. 2 = if "enrolled population" variable is "Always the Same" or "Same for SY, No DMIS prev SY" and the first enrollment DMIS ID is a control site. 0 = Otherwise.
Age for study year	Age at December 31, calculated from date of birth and study year.
Five-year age categories	Four-level age category variable for study year: Less than 18 years, 18–44 years, 45–64 years, or 65+ years.
Relationship category	Classified as child, spouse, parent, or other.

Creation of Identifier Files for Data Extraction from DDS and FMP Files

For the round-two data extraction process, two files were sent to PASBA that contained lists of unique patient identifiers for all the asthma patients we identified as being in our sample for the analysis of guideline effects. We requested an extraction of all encounter

records for these patients for all MTF and network provider services and pharmacy prescriptions. One file was to be used to extract all claims for each patient identifier from files that use the DDS relationship variable (outpatient and inpatient network provider files, NMOP files), and the other was to be used to extract claims from files that use the FMP identifier (SIDR, SADR, PEC pharmacy data).

To create the identifier files, an index file was constructed that contained all unique sponsor SSN/FMP and sponsor SSN/DDS combinations for all patients identified as continuously enrolled at one of the demonstration or control sites. All identifiers reported in all the MTF encounter records and network provider HCSRs were captured. Patient identifier records then were output to each of the two-identifier files, using the following rules:

A. Identifier file for extraction of data from files using the DDS relationship variable (network provider NCSRs, NMOP)—

1. If the relationship variable is based on a DDS then output the record with sponsor SSN and DDS.
2. If the relationship variable is based on FMP:
   a. If the person is a child (FMP 1–19) then do the following:
      1) If FMP is 1–4 then output one record for each FMP 1–4 (four records)
      2) If FMP is 5–19 then output record with this FMP as well as one record for each FMP 1–4 (five records).
   b. If the person is a spouse (FMP 30–39):
      1) If FMP is 30 or 31 then output one record for both FMP 30 and 31 (two records)
      2) If FMP is 32–39 then output record with this FMP as well as one record for each FMP 30 and 31 (three records).
   c. If the person has any other code, output one record.

B. For identifier files for extraction of data from files using the FMP relationship variable (SIDR, SADR, MTF pharmacy) only the FMP variable is used because there is no DDS identifier in the encounter records—

a. If the person is a child (FMP 1–19) then do the following:
   1) If FMP is 1–4 then output one record for each FMP 1–4 (four records)
   2) If FMP is 5–19 then output record with this FMP as well as one record for each FMP 1–4 (five records).
b. If the person is a spouse (FMP 30–39) then do the following:
   1) If FMP is 30 or 31 then output one record for both FMP 30 and 31 (two records)
   2) If FMP is 32–39 then output record with this FMP as well as one record for each FMP 30 and 31 (three records).
c. If the person has any other code, output one record.

Definition of Key Outcome Variables

Indicators selected for the evaluation of guideline effects were those that could be measured using available administrative data on health-care encounters, use of prescription medications, and the demographic and clinical characteristics of the patients. The data employed to derive these variables were in the master file for the asthma patients in the study sample, along with the comprehensive encounter data obtained in the round-two data extraction. For each outcome variable, we subset the records for the sample from the master file and used the unique RAND ID codes to merge patient data to the round-two encounter or claims data required to derive the variable. When we obtained round-two data from PASBA, we appended the RAND ID codes to each encounter or claim record in the data using the sponsor SSN/patient birth date combination as the linking variable.

We could obtain the data for all encounters from the round-two data extraction except the network provider outpatient services. The DoD files containing these records were extremely large because they contained records for all TRICARE beneficiaries. Because of limitations of the data system on which PASBA operated to extract the data, they were not able to use standard data management methods to merge the index file of patient identifiers to the identifiers on the claims data. They attempted to perform the data abstraction on subsets of DoD data by month of year, but the resulting data files were

inconsistent in format and content, and we were not able to use them.

The specific data elements are defined below, followed by a table of the codes used to measure them:

Enrollment Type. Two variables were derived and used to define enrollment status at a demonstration or control MTF. The first was a variable that identified whether a patient was ever enrolled at one of these MTFs or enrolled with a network provider but resided in the catchment area of one of the MTFs. The second variable identified whether the patient was continuously enrolled in the same place or changed enrollment during the relevant year. Using these two variables, we included in our sample any patient who was continuously enrolled in the same place and that place was one of the demonstration or control MTFs. The enrollment type variables also were used to identify comparison populations for some of the analyses.

Patient Age. The variable for patient age was defined as the age of each patient at the end of each calendar year, which was calculated using the date of birth variable established on the master file. We also derived a categorical variable for patient age, which was used in some of the analyses. This five-level variable had the age categories of <6 years, 6–18 years, 18–44 years, 45–64 years, and 65 years and older.

Asthma Control Medication Use. Three categories of asthma control medications were defined, reflecting different aspects of asthma management. Long-term controller medications are taken to prevent occurrence of exacerbations, and complementary medications assist in the control process. Using the National Drug Category codes in the MTF pharmacy data and NMOP data, long-term controllers were defined to include inhaled corticosteroid, leukotriene inhibitor, $Beta_2$-agonist/CS, and oral corticosteroid. Complementary medications were defined to include anticholinergic, $Beta_2$-agonist/LA, and methylxanthine. Short-acting rescue medication was defined as $Beta_2$-agonist. For each medication group, patients with at least one prescription for the medication during a study year in either the MTF pharmacy or NMOP data were coded as using the medication.

Use of Outpatient Services. For each patient in the study sample, asthma-related outpatient visits were identified from the data in

the SADR because these patients were getting their outpatient care at the MTF at which they were enrolled. An asthma-related outpatient visit was defined as an MTF outpatient clinic encounter with an asthma diagnosis code, excluding emergency room visits. The asthma-related outpatient visits were summed for each patient, and visit rates were calculated as the sum of visits across all patients in a group divided by the number of these patients.

Use of Emergency Room Services. We were able to measure asthma-related emergency room visits only for MTF emergency rooms because we did not have the data needed to identify emergency room visits in the network provider outpatient data.[1] The emergency room visits probably are undercounted because of these missing data, but we believe that the undercount is small because most patients enrolled at an MTF are likely to use the MTF emergency room when they need such care. An asthma-related emergency room visit was defined as an emergency room encounter with an asthma diagnostic code. The emergency room visits were summed for each patient, and visit rates were calculated as the sum of visits across all patients in a group divided by the number of these patients.

Hospital Inpatient Use. A variable was created that contained the count of asthma-related hospital inpatient stays for each patient in the sample, including stays at MTFs and community hospitals that are network providers. An asthma-related inpatient stay was defined as an inpatient encounter with an asthma diagnostic code. The inpatient stays were summed for each patient, and hospitalization rates were calculated as the sum of all inpatient stays across the patients in the sample divided by the number of patients.

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[1] There is a variable in the HCSRs that identifies the type of outpatient encounter, so it is possible to identify network provider emergency room visits. However, we had not obtained that variable in the network provider data for this study, so we had to work with only the MTF emergency room information.

Cost Estimation Methodology

Estimation of MTF Unit Costs

To estimate the costs of care for asthma patients at the Army MTFs included in this study, MEPRS financial data were used to develop sets of unit costs for inpatient and outpatient encounters. The relevant estimated unit cost then was applied to each unit of service included in the SIDR and SADR encounter records. We note there has been some criticism in DoD that the MEPRS data overestimates the MTFs' costs of doing business. The source of this criticism is a reported overestimation of the available hours of military personnel time for patient care activities because personnel often do not record time that they spend on military-related activities. While acknowledging this issue, we also understand that MEPRS offers the best available data, and it is the basis for all other cost estimations for the demonstration.

Indicator of Guideline Effect	Codes Used for the Definition
Percentage of asthma patients using long-term controllers	Use of long-term controller medication was defined as having at least one prescription for an inhaled corticosteroid, leukotriene inhibitor, $Beta_2$ agonist/CS, or oral.
Percentage of asthma patients using complementary medications	Use of complementary medications was defined as having at least one prescription for $Beta_2$ agonist/LA or methylxathine.
Percentage of asthma patients using short-acting rescuer medications	Use of short-acting rescuer medications was defined as having at least one prescription for $Beta_2$ agonist.
Number of outpatient visits per asthma patients	Outpatient visit was defined as a visit to any MTF clinic except the emergency room (MEPRS code BI).
Number of emergency room visits per asthma patient	MTF emergency room visit was identified using MEPRS code BI (network provider emergency room use data were not available for this study, but also should be included).
Number of hospitalizations per asthma patient	Each SIDR or network provider inpatient encounter was identified as a hospitalization.

The cost estimation methodology we developed mirrors its approach to the PLCA method developed by SRA International for the Medicare-DoD Subvention Demonstration. For this cost analysis, we used cost and workload data that SRA generated for MTF outpatient clinics or inpatient wards for all MTFs in the DoD system for fiscal year 1998. The estimated unit costs included total direct and indirect expenses for each MTF cost center (ward or clinic), including direct expenses for staff time and supplies as well as indirect expenses for ancillary clinical services, administrative services, and maintenance and other support services. We summarize here the methodology for calculating the inpatient and outpatient costs.

We updated the unit costs to FY 1999 estimates by applying an inflation factor of 1.4 percent. These same unit costs were applied to encounters for both study years. By holding costs constant over time, any observed changes in costs between study years one and two can be attributed to changes in utilization.

We tested two references for Medicare cost increases to determine the 1.4 percent inflation rate. The first was the trend in the U.S. per-capita costs (USPCC) for fee-for-service beneficiaries that the Health-Care Financing Administration Office of the Actuary calculates each year. For the years 1996 through 1999, the USPCC increased at an annual rate of 1.4 percent. We also used the annual rate of increase in the M+C county-level capitation rates, which the Balanced Budget Act of 1997 mandated are to be equal to the rate of increase in Medicare fee-for-service costs. The annual updates used by HCFA to establish the capitation rates for calendar years 1999 and 2000 were 1.88 percent and 0.90 percent increases, respectively, over the previous year. These also average to 1.4 percent. Because DoD payment policies mirror Medicare policies, payments discounted using this inflation rate represent increases in what either DoD or Medicare would have paid community providers if the service had been provided in FY 1998 instead of FY 1999.

Inpatient Stays

We estimated the cost per inpatient stay for each MTF inpatient stay using the following formula:

Cost for inpatient stay i in ward j =
(medical per diem cost)$_{ij}$ x (number of days)$_{ij}$ +
(surgical per diem cost)$_{ij}$ x (number of days)$_{ij}$ +
surgical cost for surgical DRG,

where the number of bed days for each type of inpatient ward—medical or surgical—is the sum of the ward and ICU days in the SIDR. DRG is the Diagnosis-Related Group assigned to each inpatient stay based on the patient's principal diagnosis and treatment. Medicare uses DRGs as the basis for payments for inpatient services, and DoD uses DRGs to establish amounts billed to third-party insurers for MTF inpatient services.

- For each inpatient ward in an MTF identified by the MEPRS level-3 accounts (the level that inpatient wards are coded in the SIDR data), we obtained the following MEPRS data that we used to calculate average total per diem expenses: Total expenses including all stepped-down expenses from MEPRS accounts D and E *except for* surgical expenses (anesthesia, surgery suite, and recovery room expenses).[2] These costs included clinical salaries, direct operating costs, support costs, allocated intensive-care unit and ancillary service costs, allocated costs from purification of cost pools that contain costs related to more than one account, and resource sharing costs that SRA assigned to the inpatient ward.
- Total number of occupied bed days (OBD) during the year, which will be used with total expenses to generate an estimated total expense per OBD.
- For each surgical DRG, we obtained an estimated average MTF-level surgical expense that included expenses for anesthesia, surgery suite, and recovery room. This cost estimate was derived as

[2] The MEPRS D accounts are clinical ancillary services (e.g., pharmacy, pathology, intensive care), and the E accounts are support services (e.g., administration, housekeeping, laundry, depreciation).

the total MTF surgical expenses divided by the total weights of surgical DRGs during the year, where surgical costs were estimated using the same method that SRA applied for the PLCA calculations. For each surgical disposition, we multiplied the MTF average surgical cost by the DRG weight for the DRG assigned to the patient stay.

This approach allowed us to capture all expenses for an inpatient stay using a consistent methodology across all the years of inpatient records included in our analysis. This method smooths out errors in reporting movement of patients between ICUs and regular inpatient wards by estimating average per-diem costs that include costs for the regular ward services plus related ICU services. At the same time, it captures the onetime costs associated with the surgical procedure performed for each surgical stay by applying these costs separately for each event. The method also allows costs to increase with length of stay, thereby capturing some of the additional costs incurred by the older population. However, this approach assumes that ancillary costs are a linear function of days, whereas it is known that these costs tend to be concentrated in the early days of an inpatient stay (Carter and Melnick, 1990). Therefore, the method sacrifices some precision in estimating ancillary service costs, although SRA has informed us that total MTF ancillary costs correlate strongly with length of stay.

Outpatient Visits

For each clinic in an MTF identified by the MEPRS level-4 accounts (the level that clinics are coded in the SADR data), we obtained the following MEPRS data that we used to calculate average total expenses per outpatient visit:

- Total MEPRS level-4 expenses for the clinic for each year, including the resource-sharing expenses that SRA has estimated and assigned to each clinic.
- The MEPRS count of total outpatient visits in the clinic during the year.

- Within the total expenses, separate identification of the expenses for laboratory, radiology, pharmacy, all other ancillary services (including allocated costs from purification of cost pools), and resource sharing.

These data allowed us to calculate the average total cost per visit for each clinic in an MTF and to estimate the shares of the total clinic expenses that are attributable to ancillary services.

APPENDIX C

Modules of the Climate Survey

GUIDELINE IMPLEMENTATION SURVEY
RAND Process Evaluation
(Team Level)

What is the name of your MTF: _____

Completion of this survey is voluntary. You may skip any question that you do not want to answer. Please understand that your answers are completely private and confidential. Your identity will never be attached to the opinions and experiences expressed in this survey.

Please feel free to use the back of this survey booklet to give us your reactions to our process evaluation, tell us about your experience at the conference, or anything else you think is important. **THANK YOU VERY MUCH FOR YOUR TIME AND PARTICIPATION.**

MODULE A THROUGH C

Dimensions of motivation addressed in Module A:

- Improve quality of care for patients
- Improve patient satisfaction with their care
- Improve the efficiency of patient care
- Reduce error in treatment, ordering tests, and medication
- Improve decisions for specialty referrals
- Make the job easier
- Increase the satisfaction with what is being accomplished
- Reduce legal liability exposure.

Module B Items **Supportiveness of Climate for Guidelines (four-level response from "no action" to "strong action")**	**Module C Items** **Attitudes About Practice Guidelines (Scale of 1 = strongly disagree to 7 = strongly agree)**
How likely is it that a staff member in your MTF would be noticed if he or she did not cooperate with guideline implementation?	Practice guidelines (do not) oversimplify diagnostic and treatment decisions in medicine.
How risky would it be for a staff member in your MTF not to cooperate with guideline implementation?	Practice guidelines could help me deliver better patient care.
What do you think would be done if management noticed that a staff member was cooperating with guideline implementation?	Use of practice guidelines in medicine will (not) limit a physician's freedom to take action.
What do you think would be done if management noticed that a staff member was not cooperating with guideline implementation?	Practice guidelines help reduce variation in clinical practice.
How likely is it that management would encourage a staff member to follow procedures established to implement the guideline?	Use of practice guidelines will (not) reduce provider efficiency.
How likely is it that management would praise a staff member for cooperating with guideline implementation?	Use of practice guidelines is a good way to summarize and reinforce scientific evidence on diagnosis and management of specific conditions.
How likely is it that management would notice that a staff member did not have the resources to follow guideline procedures?	

MODULE E

INSTRUCTIONS

In this section you are asked to assess your MTF's efforts to improve the quality of care and services it provides. Please read each statement carefully. Indicate the extent to which you agree or disagree that the statement characterizes your MTF by circling the appropriate response (1 = Strongly Disagree, 5 = Strongly Agree). In answering the questions, you should think about what the MTF is actually like now, not how you think it might be in the future or how you might wish it to be.

RESPONSE CATEGORIES

In circling a response, please keep in mind the following general guidelines regarding the choices of response categories:

- Circle **Strongly Agree** when the statement represents a completely accurate description of your MTF.
- Circle **Strongly Disagree** when the description is completely inaccurate.
- Circle **Neither Agree Nor Disagree** when you believe the statement is neither a particularly accurate nor a particularly inaccurate description of your MTF. This situation may arise because there is wide variation in the activities the statement describes. For example, you might circle neither agree nor disagree when the statement is true of some departments but not of others.
- Circle "**Don't Know"** if you do not have enough information to answer a question.

GLOSSARY/SPECIAL INSTRUCTIONS

MTF:	When asked to make a global judgement about your MTF, please respond based upon your knowledge and experience of the department or area in which you are currently employed, the other departments you come in contact with, and the information you have on your MTF as a whole.
Quality of Care and Services:	Throughout the survey you are asked to make judgements about the "quality of care and services provided." "Quality of care and services" is a general category and refers to the technical quality of care to patients and how well patient services needs are met in your MTF.

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Don't Know
LEADERSHIP						
1. The Command Group provides highly visible leadership in maintaining an environment that supports quality improvement.	1	2	3	4	5	9
2. The Command Group consistently participates in activities to improve the quality of care and services.	1	2	3	4	5	9
3. The Command Group has demonstrated an ability to manage the changes (e.g., organizational, technological) needed to improve the quality of care and services.	1	2	3	4	5	9
4. The Command Group acts on suggestions to improve the quality of care and services.	1	2	3	4	5	9
5. The Command Group generates confidence that efforts to improve quality will succeed.	1	2	3	4	5	9
INFORMATION AND ANALYSIS						
6. The MTF uses a wide range of data and information about the quality of care and services to make improvements.	1	2	3	4	5	9
7. The MTF continually tries to improve how it uses data and information on the quality of care and services.	1	2	3	4	5	9
8. The MTF continually tries to improve the accuracy and relevance of its data on the quality of care and services provided.	1	2	3	4	5	9
9. The MTF continually tries to improve the timeliness of its data on the quality of care and services provided.	1	2	3	4	5	9
EMPLOYEE INVOLVEMENT IN QUALITY PLANNING						
10. MTF staff are involved in developing plans for improving quality.	1	2	3	4	5	9

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Don't Know
11. Non-managerial staff are playing a key role in setting priorities for quality improvement.	1	2	3	4	5	9
HUMAN RESOURCE UTILIZATION						
12. MTF staff are given education and training in how to identify and act on quality improvement opportunities.	1	2	3	4	5	9
13. MTF staff are given education and training in statistical and other quantitative methods that support quality improvement.	1	2	3	4	5	9
14. MTF staff are given the needed education and training to improve job skills and performance.	1	2	3	4	5	9
15. MTF staff are rewarded and recognized (e.g., financially and/or otherwise) for improving quality.	1	2	3	4	5	9
16. MTF staff have the authority to correct problems in their area when quality standards are not being met.	1	2	3	4	5	9
17. MTF staff are supported when they take necessary risks to improve quality.	1	2	3	4	5	9
18. The MTF has an effective system for employees to make suggestions to management on how to improve quality.	1	2	3	4	5	9
QUALITY MANAGEMENT						
19. The quality assurance staff effectively coordinate their efforts with others to improve the quality of care and services the hospital provides.	1	2	3	4	5	9
20. The MTF has effective policies to support improving the quality of care and services.	1	2	3	4	5	9
21. The MTF works closely with suppliers to improve the quality of their products and services.	1	2	3	4	5	9

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Don't Know
22. The MTF tries to design quality into new services as they are being developed.	1	2	3	4	5	9
23. The MTF views quality assurance as a continuing search for ways to improve.	1	2	3	4	5	9
QUALITY RESULTS						
24. The MTF has done a good job of simplifying how care and services are provided.	1	2	3	4	5	9
25. Over the past few years, the MTF has shown steady, measurable improvements in the quality of care provided to medical, surgical and obstetric patients.	1	2	3	4	5	9
26. Over the past few years, the MTF has shown steady, measurable improvements in the quality of care provided by clinical support departments such as laboratory, pharmacy, and radiology.	1	2	3	4	5	9
27. Over the past few years, the MTF has shown steady, measurable cost reduction while maintaining or improving quality.	1	2	3	4	5	9
CUSTOMER SATISFACTION						
28. The MTF does a good job of assessing current patient needs and expectations.	1	2	3	4	5	9
29. MTF staff promptly resolve patient complaints.	1	2	3	4	5	9
30. Patients' complaints are studied to identify patterns and prevent the same problems from recurring.	1	2	3	4	5	9
31. The MTF uses data from patients to improve services.	1	2	3	4	5	9
32. The MTF uses data on customer expectations and/or satisfaction when designing new services.	1	2	3	4	5	9

APPENDIX D

Physician Questionnaire

Asthma Guideline Implementation at Nine Months

Primary Care Providers Questionnaire

This questionnaire is designed to identify areas of the asthma guideline and toolkit items that may need further attention and to help support implementation of clinical practice guidelines. It is also designed to assess the range of effects (both positive and negative) the use of the guideline is having on Army medical staff, clinical practice, and patient care.

Completion of this questionnaire is voluntary. You may skip any question that you do not want to answer. Please understand that your answers are completely private and confidential. Your identity will never be attached to the opinions and experiences expressed in this survey.

Thank you very much for your time and participation.

SECTION A: ABOUT THE ASTHMA GUIDELINE

Card 1
FORM 3

1. Have you received a copy of the:

(Check One Box on Each Line)

	Yes	No	
a. Full asthma guideline?	❑1	❑2	3/
b. Laminated one-page asthma guideline containing its key elements	❑1	❑2	4/

2. Do you agree or disagree with the following statements about the DoD/VA asthma guideline?

(Check One Box on Each Line)

The DoD/VA Asthma guideline . . .

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	
a. has helped me provide better care to my asthma patients	❑1	❑2	❑3	❑4	❑5	5/
b. has no effect on the way I treat my asthma patients	❑1	❑2	❑3	❑4	❑5	6/
c. is confusing for me to follow	❑1	❑2	❑3	❑4	❑5	7/
d. is applicable to all asthma patients	❑1	❑2	❑3	❑4	❑5	8/
e. has reduced my flexibility to treat asthma patients	❑1	❑2	❑3	❑4	❑5	9/
f. has increased the time I spend with asthma patients	❑1	❑2	❑3	❑4	❑5	10/
g. has made it easier to communicate treatment plans to patients	❑1	❑2	❑3	❑4	❑5	11/
h. has required me to see my asthma patients more frequently	❑1	❑2	❑3	❑4	❑5	12/
i. has taught me something I did not know before	❑1	❑2	❑3	❑4	❑5	13/
j. has reduced variations in the way I treat my asthma patients	❑1	❑2	❑3	❑4	❑5	14/

SECTION B: ABOUT THE ASTHMA TOOLKIT ITEMS

3. Have you received a copy or seen the following:

(Check One Box on Each Line)

	Yes	No	
a. Pocket card containing the asthma guideline key elements	❑1	❑2	15/
b. Documentation Form 701-R for asthma	❑1	❑2	16/
c. Master Problem Form 702-R for asthma	❑1	❑2	17/

d. Patient Action Plan Form 703-R for asthma	❑1	❑2	18/
e. Patient Education Form 704-R for asthma	❑1	❑2	19/
f. Patient education pamphlet(s) for asthma	❑1	❑2	20/
g. Patient education video for asthma	❑1	❑2	21/

4. How would you rate the following toolkit items?

(Check One Box on Each Line)

	Excellent	Very Good	Good	Fair	Poor	Not Used/ Don't Know	
a. Pocket card	❑1	❑2	❑3	❑4	❑5	❑6	22/
b. Documentation Form 701-R	❑1	❑2	❑3	❑4	❑5	❑6	23/
c. Master Problem Form 702-R	❑1	❑2	❑3	❑4	❑5	❑6	24/
d. Patient Action Plan Form 703-R	❑1	❑2	❑3	❑4	❑5	❑6	25/
e. Patient Education Form 704-R	❑1	❑2	❑3	❑4	❑5	❑6	26/
f. Patient education pamphlet(s)	❑1	❑2	❑3	❑4	❑5	❑6	27/
g. Patient education videos	❑1	❑2	❑3	❑4	❑5	❑6	28/

5. Currently, do you use the asthma outpatient documentation form 701-R to document your care of asthma patients?

❑Yes **GO TO Q. 6**

❑No **GO TO Q. 7**

6. How often do you fill out asthma outpatient documentation form 701-R?

(Check One Box on Each Line)

	Always	Usually	Sometimes	Never	
a. At first visit by an asthma patient	❑1	❑2	❑3	❑4	29/
b. At second and subsequent visits by an asthma patient	❑1	❑2	❑3	❑4	30/
c. When asthma is a secondary diagnosis	❑1	❑2	❑3	❑4	31/

7. *How often is documentation form 701-R available to you at the following locations?*

(Check One Box on Each Line)

	Always	Usually	Sometimes	Never	
a. With patient's chart (where chart is available) at time of visit by an asthma patient	❑1	❑2	❑3	❑4	32/
b. In the exam room	❑1	❑2	❑3	❑4	33/

8. *How often do you document severity in the patient medical chart?*

❑ 1 At every visit 34/
❑ 2 Occasionally
❑ 3 Never

9. *Do you use MEDCOM form 702-R for the patient action plan?* 35/

❑ Yes **GO TO Q. 10**
❑ No **CONTINUE with Q. 9a**

9a. *Please indicate why not?* 36/

(Check one)

❑ 1 I prefer to use my MTF's developed form
❑ 2 I prefer to use my own form
❑ 3 I don't use a patient action plan

SECTION C: ABOUT IMPLEMENTATION

10. *Have you participated in a formal training / education session(s) focused on the asthma guideline?*

❑1 Yes → **CONTINUE WITH Q. 10a** 37/
❑2 No → **GO TO QUESTION 11**

10a. *Please rate how helpful the training / education session(s) was for you.*

(Check One)

Extremely Helpful	Very Helpful	Somewhat Helpful	Not Helpful at All	
❑ 1	❑ 2	❑ 3	❑ 4	38/

11. *Based on your experience, rate the extent to which the following factors supported or impeded your implementation of the asthma guideline.*

(Check One Box on Each Line)

	A major Barrier	*A Minor barrier*	*Neither a Barrier nor a Facilitator*	*A Minor Facilitator*	*A Major Facilitator*	
a. *Command support*	❑*1*	❑*2*	❑*3*	❑*4*	❑*5*	*39/*
b. *Credibility of guideline*	❑*1*	❑*2*	❑*3*	❑*4*	❑*5*	*40/*
c. *You belief in value of patient education*	❑*1*	❑*2*	❑*3*	❑*4*	❑*5*	*41/*
d. *Competing priorities for staff time*	❑*1*	❑*2*	❑*3*	❑*4*	❑*5*	*42/*
e. *Turnovers and deployments*	❑*1*	❑*2*	❑*3*	❑*4*	❑*5*	*43/*
f. *Support of ancillary staff*	❑*1*	❑*2*	❑*3*	❑*4*	❑*5*	*44/*
g. *Staff education sessions I attended about asthma guideline*	❑*1*	❑*2*	❑*3*	❑*4*	❑*5*	*45/*
h. *Time to process patients under guideline*	❑*1*	❑*2*	❑*3*	❑*4*	❑*5*	*46/*
i. *Documentation form 701-R*	❑*1*	❑*2*	❑*3*	❑*4*	❑*5*	*47/*
j. *Existing procedures*	❑*1*	❑*2*	❑*3*	❑*4*	❑*5*	*48/*
k. *Monitoring of performance*	❑*1*	❑*2*	❑*3*	❑*4*	❑*5*	*49/*

12. *Are you familiar with the DoD/VA metrics (priority indicators) recommended for monitoring implementation of the asthma guideline?*

❑ *1 Yes* *50/*

❑ *2 No*

13. *Have you been given any feedback on your MTF's, clinic's, or personal performance regarding treatment of asthma in the last six months?*

❑ 1 *Yes* ↣ ***CONTINUE WITH Q. 13a*** *51/*

❑ 2 *No* ↣ ***GO TO Q. 14***

13a. *Please rate how helpful the data was to you?*

(Check One)

Extremely Helpful	*Very Helpful*	*Somewhat Helpful*	*Not Helpful*	
❑ 1	❑ 2	❑ 3	❑ 4	*52/*

SECTION D: ABOUT EFFECTS OF THE ASTHMA GUIDELINE

14. *Has the asthma guideline led you to increase or decrease your referrals to the following services?*

(Check One Box on Each Line)

	Increased Greatly	*Increased Somewhat/ Slightly*	*Remained About the Same*	*Decreased Somewhat / Slightly*	*Decreased Greatly*	*Not Applicable or Available*	
a. *Asthma education center/classes*	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	*53/*
b. *Spirometry*	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	*54/*
c. *Test for airway hyperresponsiveness methacholine challenge*	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	*55/*
d. *X ray*	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	*56/*
e. *Respiratory therapy*	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	*57/*
f. *Allergist/ immunologist*	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	*58/*
g. *Pulmonologist*	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	*59/*
h. *Other asthma specialist*	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	*60/*
i. *Case manager*	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	*61/*
j. *MEB review*	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	*62/*
k. *Smoking cessation program*	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	*63/*

15. *Do you agree or disagree with the following statements about effects of the asthma guideline on patients?*

(Check One Box on Each Line)

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Don't Know	
a. Asthma patients are now more satisfied with the care they receive	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	64/
b. Asthma patients complain more frequently that they do not get the treatment they expect	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	65/
c. Asthma patients take more responsibility for their care	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	66/
d. Asthma patients are less likely to require emergency treatment	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6	67/

16. *Does the guideline make the following specific recommendations about the treatment of asthma patients?*

(Check One Box on Each Line)

	Yes	No	Don't Recall	
a. Recommend use of spirometry at least every six months	❑1	❑2	❑3	68/
b. Provide asthma patients with written action plans	❑1	❑2	❑3	69/
c. Classify asthma severity at every visit	❑1	❑2	❑3	70/
d. Prescribe long term control medication for mild intermittent asthma	❑1	❑2	❑3	71/

17. *The guideline has influenced my prescribing of pharmaceuticals in the management of acute asthma patients in the following ways:*

(Check One Box on Each Line)

	Increased Prescribing	No Change in Prescribing	Decreased Prescribing	
a. Long-term controller medications	❑1	❑2	❑3	72/
b. Oral corticosteroids	❑1	❑2	❑3	73/
c. Inhaled steroids	❑1	❑2	❑3	74/
d. Inhaled short acting beta 2 agonists	❑1	❑2	❑3	75/
e. Long acting beta 2 agonists	❑1	❑2	❑3	76/
f. Leukotrene modifiers	❑1	❑2	❑3	77/

SECTION E: ABOUT YOU

18. *Are you:*

1 ❑ *Male* 78/
2 ❑ *Female*

19. *Are you a:*

(Check One)

1 ❑ *Family Practice Practitioner* 79/

2 ❑ *Internist*

3 ❑ *Other (specify)* _____ 80-81/

20. How long have you been practicing medicine?

YEARS: ☐☐ *82-83/*

21. How long have you been stationed at this MTF?

MONTHS: ☐☐ *84-85/*

22. To which location are you primarily assigned?

(Check One)

1 ❑ *Clinic* *86/*

2 ❑ *TMC*

3 ❑ *ER*

4 ❑ *Other (specify)* _____ *87-88/*

23. The purpose of the following questions is to obtain from you an assessment of your feelings regarding practice guidelines and their use in medicine.

1----------2----------3----------4----------5----------6----------7

Strongly Disagree	*Disagree*	*Slightly Disagree*	*Neither*	*Slightly Agree*	*Agree*	*Strongly Agree*

_____ *1. Practice guidelines oversimplify diagnostic and treatment decisions in medicine.* *89/*

_____ *2. Practice guidelines could help me deliver better patient care.*

_____ *3. Use of practice guidelines in medicine will limit a physician's freedom to take action.* *90/*

_____ *4. Practice guidelines help reduce variation in clinical practice.*

_____ *5. Use of practice guidelines will reduce provider efficiency.* *91/*

_____ *6. Use of practice guidelines is a good way to summarize and reinforce scientific evidence on diagnosis and management of specific conditions.* *92/*

93/

THANK YOU FOR COMPLETING THIS SURVEY.

94/

APPENDIX E

Analyses of Asthma Metrics

To test for effects of the introduction of the DoD/VA asthma guideline on service utilization and prescription patterns, we fit a series of regression models to predict effects on each of the six measures for asthma treatment. We present in this appendix tables with descriptive statistics for each measure (Tables E.1 through E.6). Results of the regression models that tested for possible effects of guideline implementation on trends for each measure are reported in Chapter Five.

Table E.1
Percentage of Asthma Patients Prescribed Long-Term Controller Medications for Target Demonstration, Other Demonstration, and Control Groups, by Year

Group	Study Year One	Study Year Two
Target demonstrations	50.9	42.8
Other demonstrations	32.5	29.9
Control sites	43.7	40.6

Table E.2
Percentage of Asthma Patients Prescribed Complementary Medications for Target Demonstration, Other Demonstration, and Control Groups, by Year

Group	Study Year One	Study Year Two
Target demonstrations	27.1	17.3
Other demonstrations	20.3	14.1
Control sites	19.9	15.9

Table E.3
Percentage of Asthma Patients Prescribed Short-Acting Rescue Medications for Target Demonstration, Other Demonstration, and Control Groups, by Year

Group	Study Year One	Study Year Two
Target demonstrations	77.0	72.8
Other demonstrations	59.2	56.8
Control sites	65.3	65.0

Table E.4
Average Annualized Asthma-Related Outpatient Visit Rates per 100 Asthma Patients for Target Demonstration, Other Demonstration, and Control Groups, by Quarter

	Study Year One				Study Year Two			
Facilities	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**
Target demonstrations	242	199	162	186	232	178	172	187
Other demonstrations	151	123	124	143	159	120	96	134
Control sites	199	168	139	158	193	156	144	164

NOTE: Annualized outpatient visit rates are calculated as four times the number of visits in a quarter divided by the number of patients in the relevant study year and applying 100 as an adjustment factor to standardize to a rate per 100 patients.

Table E.5
Average Annualized Asthma-Related Emergency Room Visit Rates per 100 Asthma Patients for Target Demonstration, Other Demonstration, and Control Groups, by Quarter

	Study Year One				Study Year Two			
Facilities	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**
Target demonstrations	25	24	28	30	30	17	21	20
Other demonstrations	29	23	23	29	29	27	19	30
Control sites[a]	39	26	30	39	36	17	21	24

[a]Excludes control site 6, which does not have an emergency room.
NOTE: Annualized emergency room visit rates are calculated as four times the number of visits in a quarter divided by the number of patients in the relevant study year, and applying 100 as an adjustment factor to standardize to a rate per 100 patients.

Table E.6
Average Annualized Asthma-Related Hospitalization Rates per 100 Asthma Patients for Target Demonstration, Other Demonstration, and Control Groups, by Quarter

	Study Year One				Study Year Two			
Facilities	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**
Target demonstrations	6	6	7	8	7	5	6	7
Other demonstrations	6	6	6	10	5	3	4	4
Control sites	7	5	5	6	6	5	5	7

NOTE: Annualized hospitalization rates are calculated as four times the number of inpatient stays in a quarter divided by the number of patients in the relevant study year, and applying 100 as an adjustment factor to standardize to a rate per 100 patients.

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